VOL. XLVII, No. 9 SEPTEMBER 1952

VETERINARY MEDICINE

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features in this issue...

Vesicular Exanthema in Swine

Infertility in Mares

Vaccination against Pneumoencephalitis (Newcastle Disease) by Atomization or Nebulization

Milk, Blood and Urine Concentrations of Aureomycin after Intramammary Infusions and Intravenous Administration

Accidental Warfarin Poisoning of Young Pigs

Value of Blood Examinations in Diagnosis

Compenamine and Procaine Penicillin: Comparative Plasma Levels in Dogs

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EDITOR

ROBERT L. ANDERES, B.S., D.V.M.

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REPRESENTATIVES

H. J. Mostyn, P. O. Box 391, Dover, N. J.
G. W. Campbell, 43 E. Northrup, Buffalo, N. Y

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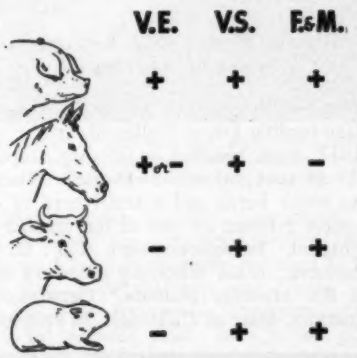
Vesicular Exanthema In Swine

As this is written, an embargo is in effect at the great Kansas City Stockyards and other livestock centers on hogs. No swine of any market class from quarantine areas are accepted at these trading centers. Hogs originating from other than quarantine areas may move under special restrictions. Traffic in hogs in Missouri and generally in the Midwest is at a virtual standstill. Counties in a number of states in the swine-producing region have been designated quarantine areas by the Secretary of Agriculture. During the last few weeks, vesicular exanthema has been diagnosed in 16 states, including Alabama, Arizona, California, Georgia, Illinois, Iowa, Kansas, Missouri, Nebraska, New Jersey, New York, Ohio, Oregon, South Dakota, Washington, and Wyoming. In all of these states, various counties, and all in California, are under quarantine.

The disease had its beginning 20 years ago in California. It has been confined to local areas there until recently, although at intervals since 1932 it has been endemic among garbage-fed swine in various parts of that state.

In a paper on methods of handling foot-and-mouth disease in the United States which was presented at the XIIth International Veterinary Congress[1] held in New York in August 1934, Dr. J. Traum, Berkeley, Calif., devoted a considerable portion of the discussion to the diagnosis of this ailment. He made particular reference to differentiation from other vesicular diseases. At that time, attention was invited to a disease in garbage-fed swine which appeared in the southern portion of California in 1933 and probably in 1932. This was clinically indistinguishable both from natural and experimental foot-and-mouth disease and from experimental vesicular stomatitis, the three recognized vesicular diseases important to livestock. In its behavior in test animals, however, the new disease-producing agent (virus) differed sufficiently from both vesicular stomatitis and foot-and-mouth disease to warrant the use of a specific term to identify it. Doctor Traum proposed vesicular exanthema, which since has been applied to this virus disease affecting the foot and mouth parts of swine.



Differential diagnosis of vesicular diseases of livestock is based on test inoculations in the four species illustrated above. Swine only are susceptible to all three virus diseases: vesicular exanthema (V.E.); vesicular stomatitis (V.S.); and foot-and-mouth disease (F. & M.).

The dangers of foot-and-mouth disease are well recognized. Damage caused when it becomes established is well known. The other two diseases are not only of importance because of loss, but in their striking similarity of symptoms to foot-and-mouth disease. The need for prompt differentiation is of gravest significance.

Early vesiculation. Note large vesicles on the sole of lower claw near heel and lateral margin, and another near the posterior cleft margin of the sole of the upper claw. Temperature of this animal was noted to be 104.8 F. at the time photograph was taken.

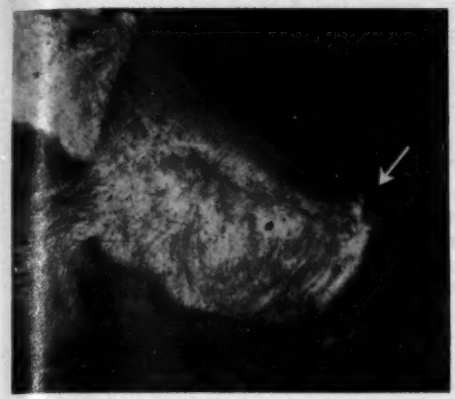
History of Vesicular Exanthema in the United States

Three outbreaks of vesicular disease in garbage-feeding lots in California in the spring of 1932 were handled as if they were outbreaks of foot-and-mouth disease[3]. These infected swine herds and a small herd of cattle and goats exposed on one of the ranches were slaughtered. Indemnities were paid. Of interest, however, is the following statement quoted from the *Monthly Bulletin*,[3] Department of Agriculture, State of California, in reference to this outbreak: "The disease in the present outbreak affected only swine. Usually foot-and-mouth disease also affects cattle, sheep, and goats. The virus of this outbreak failed to affect these animals, some of which were exposed. All swine involved were garbage-fed."

A year later another outbreak occurred in San Diego County, Calif. Symptoms in this group were lameness and sore snouts. Again strict quarantine measures were imposed, and infected, exposed animals were slaughtered. In all, 5,533 hogs on four ranches were destroyed in 1934.

The following is quoted from the original records having to do with the 1933 outbreak from the *Monthly Bulletin*,[4] Department of Agriculture, State of California: "As it appeared in hogs, the condition was a picture typical of foot-and-mouth disease, but due to confusion presented by the other tested animals, no diagnosis was made. Everything was handled as in an outbreak of true foot-and-mouth disease with the exception of burdensome and costly quarantines. The men on the ground felt that they were unable to diagnose foot-and-mouth disease, they were not justified in instituting quarantines that would have cost the people of the state large sums of money due to embargoes that would have been laid down against us to protect the rest of the state and country. Because this condition in swine presents symptoms typical of foot-and-mouth disease, great care must be exercised should similar conditions occur in the future, for a mistake in diagnosis might have serious consequences. In handling this situation it would have been easier for those in charge to diagnose foot-and-mouth disease and no one could

Lesions on the sole appear chronic within 48 hours after rupture of vesicles. This hog could not be forced to stand. Virtually the entire sole of the right foot is undergoing slough.



Snout blister just posterior to the chisel. Covering was thick and opaque; all skin layers were raised.

have questioned the diagnosis. The hard way was taken and the people of California were saved large sums of money."

The confusion referred to in the report was the fact that infective virus did not produce lesions of foot-and-mouth disease when inoculated into cattle and guinea pigs. It did infect horses. Material was sent to the BAI for further study and thence to Professor Waldman, Riems Research Institute, Germany, for identification. Waldman later indicated the virus was unlike any of the three strains of foot-and-mouth disease identified in Europe.

A third outbreak occurred a year later. During 1934, a total of 31 garbage-feeding premises and 95,000 hogs were involved. It was during 1934 that the Bureau of Animal Industry declined to participate in the payment of indemnities which rendered eradication by slaughter methods impossible since state indemnities under California law are contingent upon federal participation. California veterinarians were advised to "handle the condition in the same way that vesicular stomatitis is handled in the Middle West." In spite of the most stringent quarantine imposed by the state, the infection in California in 1934 appeared on premises throughout the central and southern parts.

In 1935, a number of mild recurrences were observed. In 1936, it was reported in 14 garbage-feeding establishments maintaining a total of 19,000 hogs. From June 1936 until December 1939, no known occurrences of vesicular exanthema were recorded. In 1939,

After rupture of vesicle, a raw, granulating surface was observed which was slightly depressed below the skin surface and mildly reddened.

the disease made another appearance, and again in 1940 the infection involved larger numbers of animals on more premises in California than in any previous year. Since 1940, there has been continuous occurrence of infection by calendar year. In a review of the disease as it existed over a period of 12 years,

Lesions on the coronary band. Vesicle may be noted (circled) on foot at right. Raised area is whitened. Such areas may partially or completely encircle the hoof. Lesions after rupture of vesicles may be noted on both feet.

Small vesicles may be noted (circled) near the posterior cleft margin. Lesions on the coronary band are covered with a blackened crust. Vesicles over these had ruptured approximately 36 hours earlier.

Dr. C. U. Duckworth[3] stated, "We feel justified in the belief that vesicular exanthema is primarily a problem in garbage-fed hogs and is probably perpetuated through the medium of infected raw pork scraps in the garbage."

During this past 20 years, vesicular exanthema has been considered to be a local problem in California feedlots. It had not been identified outside of that state. The traffic restrictions on dressed pork as they exist and the fact that little, if any, pork slaughtered in California is exported beyond the state's borders, may explain why the disease spread was limited to California feedlots.

Recent Widespread Infection

History of the present widespread epizootic dates back some six weeks prior to this writing, when the disease was identified in a garbage-feeding lot in Wyoming. It was reported that infected hogs of this lot received garbage obtained from a dining car of a transcontinental railroad. It was also reported in a number of garbage-feeding establishments and in lots of slaughter swine shipped from midwestern markets to points on the West Coast and in the South. In a matter of 14 to 21 days following the first diagnosis, outbreaks occurred in California, several midwestern points, and in New Jersey. This example of how rapidly a highly contagious vesicular disease among livestock can spread emphasizes that modern livestock marketing practices and rapid transportation are added danger factors in present day disease control.

Contagiousness has been observed to be variable. In some lots, spread has been dramatically rapid, infecting up to 100% of adults in droves within a period of hours; in others, it appears to be mild and infected individuals constitute only a small percentage of the entire lot. Lesions observed by this reporter have been mostly those on the coronary band and soles of the feet. Few animals in infected lots had lesions on the snout or mouth parts. In only a few instances has the disease been reported in grain-fed hogs. As of this date, no positive cases have been noted in native pigs on farms. Temperatures of infected animals range from 104.8 to 108 F. Elevated temperatures persist for only 24 to 36 hours and then recede rapidly. Temperature drop coincides with rupture of vesicles.

On close examination, lesions differ only slightly from those described for foot-and-mouth disease. The course of the disease, however, differs considerably and is characterized by rapid progression, both as concerns systemic reaction to infection and progressive appearance of foot lesions. The notable point is that lesions appear as chronic ulcerations within 24 to 48 hours after the vesicles rupture. Vesicles appear on the sole, most frequently along its margins, and usually adjacent to the heel or around the posterior margin of the cleft, and around the coronary band and dewclaws. These appear to be subepidermal. Covering is rather heavy, bulbous, and dull, or marble-like in appearance, rather than glistening. Vesicles tend to be confluent and thus irregular. On rupture, an amber serous fluid is discharged. Covering sloughs after 12 to 24 hours, during which time shreds of tissue cling to the wound margins. Granulation tissue beneath the blister is only slightly reddened and is depressed. Affected animals are extremely lame. Rapid regeneration occurs by a process of healing, which includes blackening over the granulation tissue, crust formation, and a gradual closing in of healthy epidermal tissue over the lesions. In some severe cases, large areas slough due to confluence of multiple vesicles. This results, in a few animals, in separation of skin at the corium, with virtual loss of the entire sole of the foot and, in fewer, loss of the hoof.

In some instances marked impairment of appetite is observed; most infected hogs continue to eat and drink. No considerable loss in weight in affected animals has been noted. Animals squeal with pain on movement, others give evidence of acute illness without high body temperature. Many will crawl and walk on the knees toward the feeding trough, and eat, others exhibit little interest and remain in lateral recumbency unless forced up. Complete recovery with healing of lesions is rapid in most cases. Mortality is nil among adults. Pregnant sows abort.

In a number of herds observed, heavy hogs were severely affected, while the infection appeared to be less virulent in its manifestations in shotes. In some instances, exposed animals weighing approximately 100 lb. showed no lesions; all heavier animals in adjacent pens were infected. Because of unsanitary conditions in most garbage feeding lots, severe secondary *Spherophorus necrophorus* infection is a common sequela.

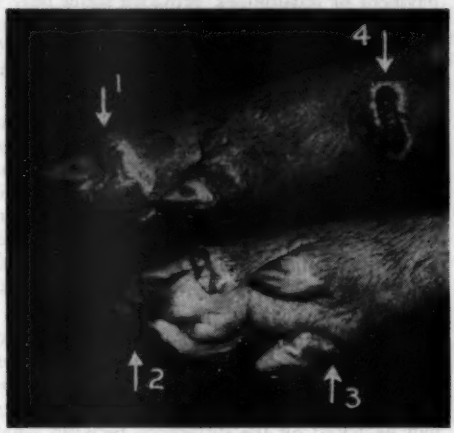
What is to be done about vesicular exanthema? This question has been posed by farmers, swine growers, and others interested, over many parts of the country. Strictest quarantine measures have been applied, and rightly so, since one is never sure, considering the close proximity of foot-and-mouth disease, that the next outbreak is not this disease rather than vesicular exanthema. Infected hogs are being held on premises. It is understood that on recovery these animals will be slaughtered.

Whether or not virus is retained in the tissue of recovered swine is not known. It is suspected, however, that no-lesion animals from infected herds and recovered animals that have been passed by federal meat inspectors might have been the source of spread by virtue of trimmings from such carcasses added to garbage. Though the disease has not appeared in the grain-feeding establishments or on farms, a dangerous factor exists. Native swine on farms are susceptible. Farm kitchen garbage should not be fed to hogs uncooked.

Eradication is the goal of regulatory officials. United States Department of Agriculture has ordered condemnation for food of infected animals and sterilization by cooking of all carcasses originating from quarantine areas. This will impose a financial burden on swine growers in these regions. Hogs from areas not under quarantine may move under restrictions into or through "clean" stockyards regardless of location, where Bureau inspection is maintained. Such animals must be slaughtered immediately and meat from these may move interstate without processing.

Control procedure by condemnation and slaughter method is proposed. In this case, all infected and exposed animals would be slaughtered, buried or burned, and indemnities paid. Preliminary information has been announced for such indemnity payment. One likely method of control is the prohibition of feeding raw garbage. Garbage pasteurization is claimed to destroy all virus diseases and most bacterial infections. It has been recommended to garbage feeders for many years.

Some veterinarians have posed the question



Appearance of feet in advanced case (approximately ten days). Extensive area of granulation (1) on coronary band, most of the heel and sole. Slough of sole (2), and around dewclaw (3). Decubital sore (4) was common in many affected animals.

of possible transmission through injected hog cholera antiserum. Consensus is that the virus of vesicular exanthema is thermolabile and is destroyed by the pasteurization procedure to which all hog cholera antiserum is now subjected.

All are concerned in the possibility of indirect infection. Disinfection procedures are being carried out. Work by Dr. A. B. Crawford[2] in 1936-37 at the Beltsville station indicates that there is slight possibility of indirect exposure and that the disease is probably spread either in pork trimmings of raw garbage or by direct contact with infected individuals.—*Robert L. Anderes, D.V.M.*

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Last Minute Reports on Vesicular Exanthema August 11, 1952

On August 1, the Secretary of Agriculture declared an emergency which makes possible payment of indemnities, provided states bear a minimum of 50% of the costs. Provisions for these actions are contained in BAI Order 376 entitled Prevention of Animal Disease: Cooperation with States.

The U. S. Department of Agriculture announced on August 7, 1952, that invitations have been sent to 15 states (California not included) to cooperate with the BAI in control and eradication of vesicular exanthema in swine. Officials of some affected states had previously petitioned the Bureau for federal indemnity payment on diseased and exposed animals.

Recovered and exposed hogs showing no evidence of the disease, on which indemnities are to be paid, will be moved directly to approved slaughter establishments. Indemnities will be based on the difference between what the owner receives from the packing establishments and the appraised value of the animals. Those exhibiting symptoms may be appraised, killed, buried or burned on the premises. Appraisals will be made by officials of the cooperating states and Bureau of Animal Industry.

Quarantine and control measures have been amended. The new instructions state: "Whether a vesicular condition is found in a feed lot, stockyards, serum plant, packinghouse, or other location, the first question to be resolved is—is it in fact a vesicular condition, and if so, is it foot-and-mouth disease?" The Bureau's state official must outline an area of quarantine, whether it be county, township, or premises, and no movement of swine or swine products will be permitted until diagnosis is determined.

Healthy swine moving from areas now quarantined to approved slaughtering establishments will be subject to regular federal meat inspection. If such inspection, either antemortem or postmortem, reveals grounds for suspecting infection, animal or carcass, as the case may be, will be condemned and promptly processed into tankage. All edible portions of meat from carcasses inspected and passed of animals originating in quarantine areas must be subjected to heat of at least 156 F. momentarily, or 145 F. for 15 minutes. No restrictions are made on healthy animals from non-quarantine areas when shipped either to approved slaughter establishments or through approved stockyards to slaughter.

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Packing industry officials calculate that it costs 7 cents to 11 cents per pound to slaughter hogs from quarantine areas. This cost is loss of products required to be tanked, boning, rendering, and sterilizing meat, and condemned carcasses.

▼

Facilities at packing centers are reported to be inadequate to sterilize all carcasses ready for slaughter in quarantine areas.

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Actually a relatively small number of herds are infected in presently quarantined areas. These are in garbage-feeding lots or in animals originating from such lots or where infection has been introduced by infected animals.

▼

Designated counties were originally quarantined. These included those counties where infection was diagnosed and, in some instances, adjoining counties. On August 8, reduction of quarantine areas was announced in ten states and additions in only two. Other areas (counties) were released except for designated townships. These changes were contained in amendments to BAI Order 309.

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Regulatory officials are to be congratulated for prompt and effective inspection and quarantine action. Alertness of inspectors at public yards, restrictions on sales barns, fairs, and the traffic in swine certainly has limited the number of outbreaks reported. Caution need be continued until all sources of infection have been dealt with to exclude the possibility of transmission. In the meanwhile, information is needed as to the possibility of transmission after clinical recovery.

▼ ▼ ▼

Dr. R. R. Dykstra, dean emeritus, School of Veterinary Medicine, Kansas State College, Manhattan, and Mrs. Dykstra have recently returned to their home following a six-week visit in South America. Their itinerary included stops at Lima, Peru; Valpariso, Chile; Buenos Aires, Argentina; and Rio de Janeiro, Brazil.

Infertility In Mares

GEORGE K. PECK, D.V.M., Oakville, Ontario, Canada

INFERTILITY in mares is the most important of breeding problems confronting horse owners and breeders. This is due principally to the extreme variation in individual animals of their estrual cycles and relative time of ovulation, together with some frequently occurring abnormalities. Generally speaking, approximately 50% of mares bred under farm conditions conceive. Perhaps the most obvious reason for this low fertility rate is that horses have not been culled on the same basis as have cattle, sheep and swine. A mare still remains useful as a work animal even though she may breed and produce a foal only occasionally or not at all. As a result, there has not been a tendency to improve fertility in mares by selective breeding, and variations have been allowed to increase through lack of selection. The result is a relatively low fertility rate among horses, as compared to other classes of livestock[1].

It is apparent that as long as the death rate in our work horses is in excess of the birth rate, every effort must be made to overcome the problem of infertility, and by so doing increase the number of mares giving birth to healthy foals.

A further need for adequate means to correct this problem is clearly evident when one considers the position of the horse in agriculture. Not only is the horse still an important work animal, but Thoroughbred and Standardbred horses are central figures in one of the world's most popular sports. Riding and hunting also provide healthful recreation for many.

Infertility in mares may result from the following causes: (1) genital tract abnormalities, (2) estrual cycle irregularities, (3) breeding to a stallion of impaired fertility, (4) incorrect time of service during the estrual cycle and a limited breeding season, (5) a low state of nutrition, and (6) miscellaneous factors.

Genital Tract Abnormalities

Wind-sucking, or the aspiration of air into the vagina through the vulva, is to be regarded as the most common cause of barrenness in Thoroughbred mares. Infections of the genital tract that result usually are responsible factors in over 50% of mares barren for more than three years[2]. Wind-sucking may be defined as the constant or occasional dilation of the vagina and sometimes the uterus by the aspiration of air and foreign material into these organs[3]. This condition is caused by trauma at service or parturition, and also by the conformation of the hindquarters and the vulva. The upper commissure of the vulva may be located too far above the pelvic floor, thus allowing air and subsequent infection easy entry. Sunken perineal regions and atrophy of the tissues around the external genitalia are predisposing factors in aged mares. The ideal anatomical position of the vulva should be at an angle of about 80°; the union of the upper commissure should extend below the floor of the pelvic girdle. In maiden mares, the near or over-perpendicular vulva is commonly seen, and in aged mares the tendency is toward the partially horizontal position due to a sunken perineal region. It is evident that both of these predispose to wind-sucking.

In most cases, bacteriological examination of swabs of genital secretions from wind-sucking mares reveals the predominance of a beta-hemolytic Streptococcus belonging to the Lancefield group C. This organism normally lives on the skin and external genitalia of mares and stallions as a saprophyte and does not become pathogenic until such conditions as described lower the resistance of the genital tract. In addition, various other organisms are less common factors, such as staphylococci, *Klebsiella genitalium*, other streptococci, *Escherichia coli, Pseudomonas aeruginosa, Shigella equirulis, Corynebacterium equi, Salmonella abortivo-equina*, micrococci, chromogenic rods, molds, and Actinomycetes[4].

At present, the favored method of treatment for wind-sucking is Caslick's operation, which is performed as follows: After thorough cleansing, the upper half of the lips of the vulva are anesthetized locally by infiltration. The edges of the lips of the vulva are scarified to the depth of ½ inch. The two scarified surfaces are then brought together and held in position by metal wound clamps or sutures. Union takes place in about six days. Some of the clamps are removed on the fourth day

and all on the sixth. One per cent yellow mercuric oxide ointment is used as wound dressing. The distance that the lips are clamped together will depend upon the type of vulva and the degree of relaxation. Always close the lips to ½ inch below the floor of the pelvic girdle[6]. At parturition the vulva must be opened and then resutured 24 hours later.

In aged mares with a sunken perineal region and for those that have had several foals resulting in thin, membranous vulvar lips, there is a more complete operation consisting of the removal of more of the mucous membrane on each side. It is recommended that an incision be made from the upper commissure of the vulva down each side at the junction of the skin and mucous membrane for about 1½ to 2 inches. Peel the mucous membrane from the roof of the vulvovaginal canal, anteriorly about 1½ inches. Remove all the mucous membrane from this inner point on the roof out to the lower cut margin. In other words, take off a triangular piece of the membrane on each side of the inner lips of the vulva. Insert two deep sutures, being sure that the needle goes through the mucous membrane at the lower or inner cut surface. Tie suture on the outside, but not too tight. Above, between and below the two sutures use metal clamps to hold the cut surfaces of skin in line and in direct apposition. For suturing material, the dry dermis and tension sutures are recommended.

After four or five days remove the two deep sutures and adjust any of the clamps that have become loose or misplaced. It is frequently advisable to remove some of the old clamps and insert fresh ones at this time so that the skin wound will heal smoothly and uniformly. A mild antiseptic may be used on both the inside and outside of the wound. Upon completion of the operation, the administration of a prophylactic dose of tetanus antitoxin is a wise precaution.

Ordinarily the operation is performed under local anesthesia. In the event mares are fractious or difficult to handle, chloral hydrate may be given orally[5].

In lieu of the above surgical procedures used in the treatment of genital tract infections, the proper administration of a suitable antibiotic such as penicillin or streptomycin appears to be the most logical means of treatment. However, the use of autogenous vaccines in some cases has proven successful as have irrigations with sulfonamide and penicillin preparations in oil, azamine in oil, saline solutions, weak solutions of acriflavine, glycerine, chlorine, hexylresorcinol in oil and many others.

Another condition of some importance is seen in certain mares in which the cervix, even in estrum, does not lie sufficiently close to the vaginal floor to facilitate easy conception. Frequently, in such cases, semen is gathered after a natural service and deposited in the uterus, either in a one ounce gelatin capsule or with the aid of a long-nozzled dose syringe. In mares having cervical adhesions, distorted cervical canals, or where breeding is performed too early before the cervix is sufficiently relaxed, the ejaculation of semen into the uterus will be prevented. In such cases, insemination should be employed[6].

Subinvolution of the uterus, occurring after parturition, abortion, or retention of the fetal membranes, is an anomaly that may require attention. Spontaneous recovery usually occurs, though it may be delayed, provided there has been no marked cervical damage. This condition, like the act of wind-sucking, predisposes to secondary infections which in turn are responsible for the syndrome variously described as vaginitis, cervicitis, metritis and endometritis. These same diseases are less commonly caused by an infection introduced into the genital tract from dirty hands and unclean instruments.

There are also certain factors of comparatively little importance which might result in sterility, such as congenital abnormalities, coital exanthema, uterine leucorrhea, which is always associated with cystic ovaries, trauma from parturition, pyometra due to adhesions of the cervix, and various others.

Finally, it becomes evident that the prevention of infection of the genital tract of normal mares is primarily a problem of sanitation and breeding hygiene. Thus, as a general preventive against infection, a thorough washing of the vulva of the mare and the penis of the stallion before and after service with a non-irritating antiseptic solution is advisable.

Estrual Cycle Irregularities

During the breeding season on an efficiently managed stud under veterinary supervision, irregularities of the estrual cycle comprise approximately 80% of the clinical cases of infertility in the mare[7].

These can all be generally encompassed under the state of ovarian dysfunction, which is closely correlated by an incompletely understood mechanism, with pituitary gland activity.

As almost innumerable variations of this

type occur, it should be borne in mind that each mare must be considered as an individual case and treated accordingly. For this reason only the most common and important variations will be considered.

In the estrual cycle of the mare, the follicular phase predominates over the luteal phase and thus the most frequent irregularity is failure of follicles to ovulate because the luteinizing hormone required for this purpose is not very plentiful.

One common condition of infertile mares has been popularly described as cystic ovaries. In these cases, follicles develop on the ovaries but do not rupture. The mare frequently exhibits increased irritability and long, irregularly spaced periods of estrum. Ovarian cysts do not, as a rule, cause nymphomania as in cows. Rectal examination will reveal which of two main types exist. If there are many, small follicles (1 to 2 cm. in diameter) accompanied by an excess of fibrous tissue (fibrocystic ovaries), there is little that can be done in the way of treatment; but if one ovary has a large follicle or two (5 cm. or more in diameter) present, the condition may be treated according to the following outline.

1. Inject intramuscularly 10,000 international units (I.U.) of chorionic gonadotrophin, either alone or accompanied by surgical drainage of the follicle with a trochar *per vaginam*.

2. Palpate the ovaries daily at the first post-treatment estrum in order to determine the occurrence of normal ovulation.

3. Finally, just prior to service, a second injection of 10,000 I.U. of chorionic gonadotrophin may be given to assure ovulation at the proper time.

The procedure involved in the above mentioned surgical puncture of the follicle, or follicular trocharization, is as follows: The patient should be properly restrained, the tail bandaged and the external genitalia cleansed. One arm is introduced into the rectum, the ovary is grasped and drawn gently backward to the vaginal wall. Next, a special trochar is carried into the vagina with the other hand and the ovarian cyst is punctured through the vagina dorso-laterally and posteriorly to the cervix, thus allowing the follicular fluid to drain out through the trochar. It is important to remember that this operation must never be carried out on a mare afflicted by any disease of the genital tract.

Another condition which occurs rather frequently is that of silent heat, in which a state of anestrum is maintained along with normal follicular maturation and ovulation. If such mares are examined vaginally and rectally twice weekly, they can be covered succeesfully when typical signs of estrum are evident. A variant of this phenomenon is shown by mares in a state of anestrum whose ovaries contain a follicle 3 to 4 cm. in diameter. Most of these will respond to treatment by the injection of 10 to 15 mg. of stilbestrol in oil, or 1,500 I.U. pregnant mares' serum (PMS) to bring them into estrum, followed by 10,000 I.U. of chorionic gonadotrophin to assure ovulation.

A further case is presented by the mare showing anestrum without follicle development. This condition is observed mostly in barren mares, relatively poor in condition with long coats. When such mares shed their coats, they tend to come in heat. Many treatments have been directed toward alleviation, perhaps the most acceptable being the subcutaneous injection of 1,000 I.U. of PMS for two to three successive days. Administration of chorionic gonadotrophin also claims some measure of success.

Foaling mares often exhibit a lactational anestrum and may not come in heat until after the foal is weaned. In this case, mares are either in silent heat or are in a true

anestrum with or without follicle development and may be treated as previously outlined. In the foaling mare, a prolongation of the ninth-day estrum or foal heat, followed by a long diestrous period, is often observed. These are often every-other-year breeders[3].

Maiden mares present the problem of sexual immaturity, since some of this type can become pregnant as yearlings, while others may not produce mature follicles until five years of age or more.

Certain mares that are regular in estruation, with no apparent abnormalities, may fail to conceive when bred. Such cases are often difficult to correct, but as the condition is apparently a functional disturbance, hormones are employed as indicated[4].

Ovarian or granulosa cell tumors are most commonly seen in young mares. These almost invariably involve only one ovary. Surgical removal of the affected ovary via vagina is the treatment recommended. Mares generally breed quite successfully with the remaining ovary. Mares having very large, hard, fibro-cystic ovaries, together with an ovarian tumor, seldom conceive[4].

Small, hard ovaries are occasionally palpated in some patients and are now generally treated with hormones. Where the decrease in size is progressive, occasionally to the point of atrophy, there is no effective treatment[4].

A phenomenon which almost invariably leads to an ultimate conclusion of barrenness, is that of double ovulation, which occurs consistently in some mares and if conception takes place, the usual result is the abortion of twin foals; generally long before the end of the gestation period. Such cases can be treated if, before breeding a known "twinner", a rectal examination is made and upon finding two maturing follicles on the ovaries, one is surgically "tapped" and the other allowed to ovulate normally.

It should be noted that a rectal pregnancy diagnosis made at the proper time after the last breeding is necessary to confirm conception in mares which tend to come in heat and ovulate when pregnant as a result of the regression of the corpus luteum after the first month of pregnancy. The rat test, rabbit test, mucin test, chemical test of the urine, and others can all be used in the diagnosis of pregnancy at various times during the gestation period.

In regard to the induction of ovulation by the intramuscular administration of chorionic gonadotrophin, this hormone should be withheld until the maturing follicle is at least 3 cm. in diameter in order to assure adequate response[9]. However, it has been reported that follicles 1 cm. or more in diameter almost always ovulate in response to two subcutaneous injections of 500 mouse units of chorionic gonadotrophin given eight to 12 hours apart[10].

Finally, it must be borne in mind that experimental work has indicated that repeated injections of a gonadotrophic extract may cause the recipient to become resistant to the hormonic action of that extract, either by the formation of antibodies, or by some other process not yet understood. In this connection, there are experiments which afford evidence that the resistance produced by repeatedly giving a particular gonadotrophin is largely due to an immunity developed against a foreign protein or protein-like-body and that it is not, as so much of the literature seems to imply, a reaction which can be described correctly as antigonadotrophic[11].

Breeding to a Stallion of Impaired Fertility

Infertility in a stallion may be due to diseased genitalia, hormone deficiencies, nutritional deficiencies, senility, systemic ill health, obesity, and lack of exercise.

It has been shown that a stallion's fertility decreases after he has reached 16 years of age[12].

If infertility can be traced to a hormonal deficiency, treatment with hormones such as testosterone, pregnant mares' serum and chorionic gonadotrophin may be effective.

Possibly the best guide to a stallion's potency is frequent microscopic examination of his semen, during the breeding season, having regard to its volume, density and color and to the concentration, formation and vitality of spermatozoa.

Incorrect Time of Service During the Estrual Cycle and a Limited Breeding Season

If mares are bred at an unfavorable time during estrum, conception will not occur. The optimum time for service is the 48-hour period preceding ovulation. A previous knowledge of the length of estrum or palpation of the follicles will be of assistance in determining when to cover the mare.

Under Caslick's system of teasing, it appeared that the first three days of estrum could be considered the optimum time in which to breed the mare[3]. Nevertheless, perhaps the best method, especially if the mare is only to be bred once, is to inject intramus-

cularly 10,000 I.U. of chorionic gonadotrophin when the mare is in heat and then permit service 24 hours later.

Ninth-day breeding or breeding the mare during the foal heat is now widely discouraged, should be adopted as infrequently as possible and should not be practiced if the following conditions exist:

1. Placenta is retained for more than three hours.
2. Placenta weighs over 14 lb.
3. Foal is weak, crooked, or dead at birth or dies shortly thereafter.
4. Mare needs assistance to foal.
5. Mare discharges abnormally either in color, quantity, or consistency during the first nine days after foaling.
6. Genital tract is not clean and free from every sign of infection and inflammation when examined on the seventh or eighth day after foaling[13].

The disadvantage of limited breeding season, February to June in the Thoroughbred and May to August in farm horses, and its relationship to barrenness in the mare is obvious.

A Low State of Nutrition

Much of the work on the relationship between infertility and inadequate nutrition in the mare is still in the experimental stage. It is known, however, that deficiency of certain vitamins and minerals, notably vitamin A and iodine, have an unfavorable effect on reproductive ability.

While the role of vitamin C is still unknown, it is understood that vitamins B, D and E have little or no relationship to sterility. However, a lack of these vitamins may have an indirect effect on reproduction in that a loss of general health and consequent lowered fertility would ensue.

The mineral iodine is essential for reproduction and a deficiency of it results in weak or dead foals[14].

It is also believed that the value of fresh grass in relation to infertility is in direct proportion to its carotene-containing chlorophyll content and also to its natural estrogen content. Bearing a close relationship to the above is the fact that an increase in the hours of either daylight or artificial light has been found to expedite the onset of estrum in the mare by stimulation of nerves passing from the retina to the brain and thence to the pituitary gland. This stimulation, under natural conditions, occurs at the time of year when carotene is most abundant and the result is an increased absorption of vitamin A. Thus, in the breeding season, mares not receiving natural chlorophyll may be supplied with vitamin A.

It has been stated that the grazing of mares on pastures heavily dressed with superphosphates and other artificial fertilizers may have a detrimental effect on their fertility, but there appears, as yet, to be little actual evidence to support this view.

Miscellaneous Factors

There are many miscellaneous factors having a bearing on fertility, of which only a few need be considered.

Some experimental evidence exists supporting the contention that mares and stallions which were carried in utero for excessively long gestation periods lower the fertility percentage[15].

Obesity in brood mares is yet another matter which must be considered. This condition is glandular or nutritional in origin, or may be due simply to lack of exercise. Such mares seldom come in heat and examination of one or both ovaries usually reveals one to three follicles from 3 to 5 cm. in diameter, which persist and become cystic. Occasionally, mares of this type have fat deposits around the ovaries. The treatment for cystic ovaries as previously outlined may be attempted.

Another factor which has a relationship to infertility is hereditary in nature and concerns recognized Thoroughbred "tap root" mares whose female descendants are naturally "shy breeders"; a classic example being the English brood mare Fifinella.

In conclusion, it may be said that infertility is the major problem confronting horse-breeding, both from an economic and a scientific standpoint.

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Vaccination Against Pneumoencephalitis (Newcastle Disease) By Atomization Or Nebulization In Incubators And Chick Boxes With The B_1 Virus

E. P. JOHNSON,* D.V.M., Ph.D., and W. B. GROSS,* D.V.M.,
Blacksburg, Virginia

SINCE the writers' previous publication[1] in which it was reported that vaccination with the B_1 virus against Newcastle disease could be accomplished safely and satisfactorily by atomization or nebulization, a method has been worked out which also appears to be practicable for general use.

The earlier method of atomizing or nebulizing in a standard chick box of 100-chick capacity, leaving the top holes unpunched while introducing the vaccine through punched holes on the sides, was found to be satisfactory in most instances but the results were variable. When an optimum time-period was used for introducing the vaccine and the chicks were left in the box for from five to ten minutes before removing them, the most consistent and satisfactory results were obtained. This probably could be explained best on the basis of loss of some vaccine through the holes in the sides of the box. This method had certain drawbacks; chiefly, that the chicks had to be handled twice and had to be left in the box from five to ten minutes, which made it time consuming.

In the experiments related here, a method has been developed which is both accurate and efficient.

Atomization in Large Incubators

Because of the shortcomings of the method of atomization and nebulization in chick boxes previously mentioned, considerable work was done in an effort to determine if chicks could be vaccinated by atomization or nebulization in large incubators just before they were removed and placed in boxes to be delivered.

The first trial was made in a Buckeye incubator of 1,200-egg capacity, utilizing a no. 40 DeVilbiss nebulizer attached to a bicycle foot pump. Four ml. of B_1 vaccine from the same lot which had been found successful with the intranasal method were used. It required ten minutes to introduce this amount of vaccine by constant pumping and the chicks were removed and placed in boxes as quickly as practicable after introducing the vaccine. There were 800 chicks in the machine. At three weeks of age, 50 of the nebulized chicks and five unvaccinated chicks of similar age were challenged intranasally with the California (11914) strain of Newcastle disease virus. All controls and 28 of the 50 nebulized chicks died of Newcastle disease.

Fig. 1. Atomization or nebulization of baby chicks against pneumoencephalitis (Newcastle disease) with B_1 virus. (1) Hudson's no. 305 paint-spray pump; (2) cover for chick box; (3) chick box containing 100 day-old chicks; (4) reinforced cellophane hood which fits over standard chick box; (5) no. 40 DeVilbiss glass nebulizer.

The next trial was carried out in the same incubator with 1,148 chicks, using a no. 114 DeVilbiss atomizer and a Miller-Simmons paint spray pump as the source of forced air. Fifty ml. of similar vaccine was used over a period of eight minutes, during which time it was necessary to refill the atomizer three times. The chicks were left in the closed incubator an additional seven minutes before removing them to boxes. At three weeks of age, 35 of these chicks and six unvaccinated chicks of similar age were challenged as in the previous trial. All the controls died of Newcastle disease while only one of the atomized

*Section of Animal Pathology, Virginia Agricultural Experiment Station, Blacksburg.

chicks died. These results encouraged us to go ahead and find out what could be accomplished in larger machines.

One additional trial was made in this incubator using a no. 286 DeVilbiss atomizer with forced air as before. The amount of vaccine used was 50 ml. and it took two minutes to introduce it. The chicks were left in an extra eight minutes before being removed to boxes. On challenging 24 of these and 14 unvaccinated controls, three weeks later, all controls died of Newcastle disease, while five of the 24 vaccinated chicks died similarly affected.

The next trial was made in a larger Buckeye incubator of 6,000-egg capacity. The equipment was the same as in the previous trial. One hundred-fifty ml. of vaccine was used. It required eight minutes to introduce the vaccine and the chicks were left in the incubator an additional four minutes before they were removed and placed in boxes to go out. On similar challenge of 20 of these chicks at three weeks of age, seven died of Newcastle disease.

In a subsequent trial 1,650 chicks were atomized with equipment as in the previous experiment in a Robbin's incubator of 3,400-egg capacity. The amount of vaccine used was 100 ml. It required four minutes for the atomization and the chicks were left in an additional four minutes. Twenty-five of these chicks were challenged at three weeks of age, three of which died of Newcastle disease.

In a later trial in this Robbin's incubator, 3,000 chicks were atomized using the same equipment. The amount of vaccine used was 100 ml.; the time required for administration was four minutes; and the chicks were left in an additional 11 minutes before removing them to boxes. On challenge of 27 of these chicks, at three weeks of age, eight died of Newcastle disease.

One additional trial was made in this incubator on 2,958 chicks, using the same equipment. One hundred ml. vaccine was used; three minutes were required for introduction; and the chicks were left in an additional 12 minutes. The vaccine in this case was introduced through the top hole instead of the hole near the fan, which was used in the previous experiment. On challenging 19 of these chicks at three weeks of age, only one chick showed slight twisting of the neck, while all six controls died of Newcastle disease.

In a later trial in this incubator under similar conditions, 3,000 chicks were atomized and when 25 were challenged, at three weeks of age, 20 died of Newcastle disease.

Similar discouraging results were obtained in a Buckeye incubator of 6,000-chick capacity when a paint sprayer was used to introduce the vaccine. Discouraging results with this type of equipment were also obtained when 4,000 chicks were sprayed by this method in a Petersime incubator of 6,000-chick capacity. Discouraging results also occurred when a sprayer for automobile springs was used in three Bundy incubators of approximately 3,000-chick capacity.

Nebulization in Chick Boxes

After trying the various procedures in incubators which have just been described, it was decided to attempt to improve on the technic of nebulization in chick boxes. On the basis of previous work, it appeared that if this method could be developed so that it would be unnecessary to handle the chicks a second time as they were removed from the hatchers, this would result in a tremendous saving in labor and time. The experiments which will be related here deal, chiefly, with the development of such a procedure.

In order to eliminate the objection of having punched holes on the sides of the box as previously described, a hood was constructed of the dimensions required to fit loosely over the top of a standard chick box of 100-chick capacity. This hood, as illustrated in figure 1, is 11 in. high, measuring from the ledge which rests on the box. The sides slant slightly toward the center, making the top, outside dimensions, approximately 14 by 16 in. The sides and top are made of reinforced cellophane which is inexpensive and sufficiently transparent to allow the operator to observe the chicks during the procedure of nebulization. A 1 in. strip of wood across the top serves as a handle to lift the hood on and off the box. A strip of wood approximately 2 in. wide around the lower edge of the hood fits loosely around the outside of the box. No holes were punched in the sides of the box. If a break occurs in either the box or hood it can be mended quickly with Scotch tape. A hole large enough to introduce the barrel of the nebulizer was made in the side brace of the hood about 8 in. above the top of the box, as may be noted in the photograph. A no. 305 paint spray pump, manufactured by H. D. Hudson Manufacturing Co., was used to furnish the forced air. This gives a force of approximately four pounds of pressure per square inch which seems to be quite satisfactory when using the no. 40 DeVilbiss glass nebulizer. This type of pump is light and can be moved easily from place to place. It is

equipped with a rubber hose approximately 5 ft. long which fits the nebulizer. This motor operates on the usual 115-volt AC current. To facilitate moving the hood between boxes of chicks, a pulley could be placed in the ceiling directly over the place of operations and a piece of clothes line fastened at one end to the handle of the hood and through the pulley with a weight at the other end sufficiently heavy to hold the hood suspended while the box containing the vaccinated chicks is replaced by a new box of chicks.

The vaccine used in these experiments has been made only from the B_1 virus described by Hitchner and Johnson[8]. For the most part this has consisted of allantoic fluid harvested from embryonating chicken eggs which had been inoculated on the tenth day of incubation with the B_1 virus. This fluid was then diluted with buffered saline containing 2% glycerol so that the virus concentration resulted in an embryo LD_{50} of 10^{-6} per 0.1 ml., estimated by the method of Reed and Muench[9] at approximately the time the vaccine was used. It was kept constantly frozen at —40 C. from the time of harvesting until it was thawed to be used.

Several experiments have been carried out with commercial vaccines made from this virus in the powdered form and adding the diluent just before using them. The results have been about equally successful when the concentration of the diluted virus as determined in embryonating eggs has been approximately as stated above. When using the powdered virus, care should be exercised to get all the virus into solution before starting or the nebulizer will become clogged. If this happens, a fine wire stilette may be used to unclog the capillary opening and this should be followed by forcing some sterile water through it.

Many trials have been made with the equipment described, varying the amount of vaccine used, the time of administration, and the time the chicks were held in the closed box after completing the nebulization. Table 1 illustrates the results of a few of these. From these data it is obvious that 1.5 ml. of vaccine administered by this equipment in 1½ minutes is the best combination to use. This procedure has been carried out on lots of 100 chicks during the past year approximately every three weeks and the results obtained have been very similar to those in experiments 8, 9, and 10 in table 1.

TABLE 1. Results of Nebulizing 100 chicks at a Time in a Hood-covered box with B_1 vaccine

Exp. no.	Vaccine ml.	Time in min. required to introduce vaccine	Time in min. chicks were left in box	Symptoms	Age when challenged	Type of challenge	Controls NCD/no. birds	Nebulized NCD/no. birds
1	2.5	2.5	2	Respiratory — 8th day	3 Wks.	IN	3/3	1/40
2*	.75	1.0	2	None	3 Wks.	IN	6/6	4/10
3*	.45	.75	2.25	None	3 Wks.	IN	6/6	5/10
4*	.50	.50	2.5	None	3 Wks.	IN	6/6	6/10
5*	.30	.75	2.25	None	3 Wks.	IN	6/6	5/10
6	.75	1.50	1.50	None	3 Wks.	IN	6/6	5/10
7	2.00	2.00	1.00	Respiratory — 7th day	3 Wks.	IN	14/15	0/20
8	1.50	1.50	1.50	Slight Resp. 8th day	3 Wks.	IN	4/4	0/15
9	1.50	1.50	1.50	"	3 Wks.	IN	5/6	1/15
10	1.50	1.50	1.50	"	3 Wks.	IN	6/6	0/12

*These represent repeated trials involving 1,400 chicks; the others are with single lots of 100 chicks each.

It should be noted carefully that if more vaccine of the potency mentioned is used or if the chicks are left in the box much longer than 1½ minutes or if a vaccine having a greater concentration of virus is used, the respiratory symptoms in the chicks at about a week following the nebulization may be severe. On the other hand, if a less potent vaccine is used or if a smaller amount is used, or if the time of holding in the covered box is shortened, the chicks may not become properly immunized. If, however, this procedure is followed, 100 day-old chicks can be satisfactorily vaccinated against Newcastle disease

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Milk, Blood And Urine Concentrations Of Aureomycin After Intramammary Infusions And Intravenous Administration*

ITHEL A. SCHIPPER,** B.S., M.S., D.V.M., and W. E. PETERSEN,** B.S., M.S., Ph.D., St. Paul, Minnesota

OF the recently developed chemotherapeutic agents, aureomycin† has received much attention as an efficient therapeutic medium in the treatment of many of the bacterial, rickettsial and viral infections resistant to sulfonamides, penicillin and streptomycin. Possibilities of employment of aureomycin as a therapeutic agent in the control of bovine mastitis have been investigated by McCulloch, *et al.*,[1] Easterbrooks,[2] Packer,[3] and Slanetz and Allen[4]. The pharmacological aspects of aureomycin and its relation to veterinary therapeutics have been presented by Kanegis, *et al.*[5]. Data gathered and presented in this paper deal primarily with the physiological and pharmacological behavior of this antibiotic when introduced into cattle. Paramount considerations were the relationship of dosage and route of administration to rate and route of elimination, toxicology, and irritability to the mammary parenchyma. It is evident that a knowledge of these aspects is essential to a rational approach in employing any drug in therapy.

Experimental Procedure

Cows with and without histories of mastitis were employed in this experiment. In some instances, clinical mastitis existed during the course of administration of and assay for aureomycin. Parenteral aureomycin was administered intravenously via the jugular vein. When the drug was introduced intramammarily, the ointment preparation described by McCulloch, *et al.*,[1] or the parenteral preparation was employed. Only one quarter per cow was infused during any one assay period. When any animal was re-employed, at least one week elapsed between the last assay and the readministration of the drug. Samples of milk, blood and urine were collected at various intervals after administration, and immediately refrigerated to prevent deterioration of the antibiotic present and excessive bacterial growth. All samples were assayed within 24 hours after collection. Blood was collected from the jugular vein, permitted to clot, and the serum obtained by centrifugation. Urine samples were obtained by artificial stimulation of the micturition reflexes. Milking of all animals was carried out in the routine procedure and intervals. The methylene blue milk method of assay described by Schipper and Petersen[6] was employed on all samples of milk and blood serum. Drug concentration in urine was determined by the method described by Dornbush[7]. Detection of the irritating effects on the mammary gland were determined by the Whiteside reaction, chloride concentration, and the pH of milk before and after administration of aureomycin. Toxicology was determined by the presence or absence of abnormal physiological functions.

Results

Levels of aureomycin in the blood, urine, and milk for various dosages and methods of administration for varying time intervals following the administration of the drug are presented in table 1. It will be noted that there is a marked variation in the quantity found in the milk in the first milking and the rate of disappearance with subsequent milkings following intramammary administration.

First milkings following infusion of 200 mg. of aureomycin in ointment per quarter varied from 6.1 to 124 micrograms per ml. and variations from 6.2 to 31 micrograms per ml. when 400 mg. were infused. When the parenteral solution was infused, variations in the first milking were from 3.2 to 32 and 6.4 to 128 micrograms per ml., respectively, for infusions of 200 and 400 mg. It will be noted that the milk of quarters that were mastitic at the time of administration had higher levels in the first milk.

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**Division of Dairy Husbandry, University of Minnesota, University Farm, St. Paul.

†Aureomycin supplied by Lederle Laboratories Division, American Cyanamid Company, Pearl River, N. Y.

TABLE 1. Postadministration Levels of Aureomycin in Blood, Milk and Urine with Various Dosages of Intramammary and Intravenous Administration.

Methods of Adm.	Quan. Adm.	Animal No.	Material Assayed	Postadministration Levels in Micrograms per Milliliter									
				1 hr.	2 hr.	4 hr.	8 hr.	12 hr.	24 hr.	36 hr.	48 hr.	60 hr.	72 hr.
Intramammary	200 mg. per quarter (ointment)	793	M	—	—	—	—	6.1	6.1	6.1	6.1	0	
			B	<1.	<1.	<1.	<1.	<1.	0	0	0	0	
			U	<1.	<1.	<1.	<1.	<1.	<1.	0	0	0	
		402	M					24.8	6.1	3.1	3.1	1.5	.77
			B	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			
			U	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			
		263	M	—	—	—	—	6.2	1.55	6.2	1.5	1.5	1.5
			B	<1.0	<1.0	<1.0	<1.0	<1.0					
			U	<1.0	<1.0	<1.0	<1.0	<1.0					
		574	M	—	—	—	—	24.8	6.2	6.2	1.5		0.6
			B	<1.0	<1.0	<1.0	<1.0	<1.0					
			U	<1.0	<1.0	<1.0	<1.0	<1.0					
			M	—	—	—	—	24.8	12.4	6.2	6.2		1.2
			B	<1.0	<1.0	<1.0	<1.0	<1.0					
			U	<1.0	<1.0	<1.0	<1.0	<1.0					
		753*	M	—	—	—	—	124.0	24.8	6.2	6.2	—	6.2
			B	<1.0	<1.0	<1.0	<1.0	<1.0					
			U	<1.0	<1.0	<1.0	<1.0	<1.0					
	400 mg. per quarter (ointment)	634	M	—	—	—	—	31.0	24.8	12.4	3.1	1.5	1.24
			B	<1.0	<1.0	<1.0	<1.0	<1.0					
			U	<1.0	<1.0	<1.0	<1.0	<1.0					
		659	M	—	—	—	—	6.2	—	1.5	0.31	0.31	0.124
			B	<1.0	<1.0	<1.0	<1.0						
			U	<1.0	<1.0	<1.0	<1.0						
		753*	M	—	—	—	—	31.0	6.2	3.1	1.5	1.5	1.24
			B	<1.0	<1.0	<1.0	<1.0						
			U	<1.0	<1.0	<1.0	<1.0						
		574	M	—	—	—	—	31.0	12.4	12.4	12.4	1.5	1.24
			B	<1.0	<1.0	<1.0	<1.0						
			U	<1.0	<1.0	<1.0	<1.0						
		793	M	—	—	—	—	12.4	12.4	6.2		1.55	<1.0
			B	<1.0	<1.0	<1.0	<1.0						
			U	<1.0	<1.0	<1.0	<1.0						
	200 mg. per quarter parenteral aureomycin	753	M	—	—	—	8.0	1.0	<1.0	<1.0			
			B	—	<1.0	<1.0	<1.0	<1.0					
			U	—	<1.0	<1.0	<1.0	<1.0					
		659	M	—	—	—	3.2	1.0	<1.0		<1.0		
			B	—	<1.0	<1.0	<1.0	<1.0					
			U	—	<1.0	<1.0	<1.0	<1.0					
		634	M	—	—	—	25.6	3.2	<1.0		<1.0		
			B	—	<1.0	<1.0	<1.0	<1.0					
			U	—	<1.0	<1.0	<1.0	<1.0					
		654	M	—	—	—	32.0	12.8	<1.0		<1.0		
			B	—	<1.0	<1.0	<1.0	<1.0					
			U	—	<1.0	<1.0	<1.0	<1.0					
	400 mg. per quarter parenteral aureomycin	759	M	—	—	—	6.4	1.6	<1.0		<1.0		
			B	—	<1.0	<1.0	<1.0	<1.0					
			U	—	<1.0	<1.0	<1.0	<1.0					
		781*	M	—	—	—	128.0	1.6	<1.0		<1.0		
			B	—	<1.0	<1.0	<1.0	<1.0					
			U	—	<1.0	<1.0	<1.0	<1.0					
		253*	M	—	—	—	64.0	1.6	<1.0		<1.0		
			B	—	<1.0	<1.0	<1.0	<1.0					
			U	—	<1.0	<1.0	<1.0	<1.0					

TABLE 1. — (Continued)

Methods of Adm.	Quan. Adm.	Animal No.	Material Assayed	Postadministration Levels in Micrograms per Milliliter								
				1 hr.	2 hr.	4 hr.	8 hr.	12 hr.	24 hr.	36 hr.	48 hr.	60 hr. 72 hr.
		791	M	—	—	—	32.0	1.6	<1.0			
			B	—	<1.0	<1.0	<1.0	<1.0				
			U	—	<1.0	<1.0	<1.0	<1.0				
	1,000 mg. per quarter parenteral aureomycin	794	M	—	—	—	128.0	12.8	6.4	3.2	1.0><	1.0
			B	—	<1.0	<1.0	<1.0	<1.0				
			U	—	<1.0	<1.0	<1.0	<1.0				
Intravenous	2.5 gm. per cow	559	M	1.0	3.1	1.5	<1.0	<1.0				
			B	3.1	3.1	1.0><	1.0	<1.0				
			U	6.2	6.2	6.2	12.4	6.2	<1.0	<1.0		
		294	M	<1.0	1.0>	1.0><	1.0	<1.0				
			B	<1.0	1.0>	1.0><	1.0	<1.0				
			U	6.2	3.1	6.2	1.5	1.0><	1.0	<1.0		
		790	M	1.0	2.48	1.0><	1.0	<1.0				
			B	1.0	1.0>	1.0><	1.0	<1.0				
			U	3.1	3.1	31.	12.4	1.0><	1.0	<1.0		
		789	M	1.0	3.1	6.2	3.1	<1.0	<1.0			
			B	12.4	6.2	3.1	1.0><	1.0	<1.0			
			U	3.1	6.2	6.2	6.2	6.2	3.1	3.1	1.0	<1.0
	5 mg. per lb.	559	M	1.0	3.02	3.02	1.0><	1.0	<1.0			
			B	3.2	3.2	1.0	<1.0	<1.0				
			U	25.0	25.0	25.0	25.0	25.0	1.0			
		790	M	1.0	1.25	1.25	1.25	1.25	<1.0			
			B	1.0	1.0>	1.0><	1.0	<1.0				
			U	25.0	25.0	25.0	25.0	1.0><	1.0			
		789	M	—	1.0	3.25	3.25	3.25	1.0>	0		
			B	—	3.25	3.25	3.25	1.0><	1.0	0		
			U	—	25.0	25.0	25.0	25.0	12.0	0		
		854*	M	—	4.9	12.5	14.3	3.5	3.5	2.5	1.0	
			B	—	10.0	2.5	2.5	3.5	1.0><	1.0	<1.0	
			U	—	10.0	62.0	49.0	14.8	6.2	6.2	4.0	

* — Mastitis existed during time of administration and assay.
M — milk; B — blood; U — urine.

There is a significant difference in the rate of disappearance of aureomycin in succeeding milkings between the ointment and parenteral forms, when administered intramammarily. With the exception of the 1,000 mg. dose, which required 60 hours to get below the 1 microgram per ml., in all other cases the level of less than 1 microgram per ml. of milk was reached in 24 hours following infusion.

When the aureomycin was administered in ointment form, much more time was required for its disappearance in the milk. In only one case, (that of cow 793) the agent was not detected in the milk 72 hours or more following administration. In the case of cow 753, where a mastitic quarter was infused with 200 mg., 6.2 micrograms of the drug were found in the milk 72 hours following its administration.

Irrespective of the dose or the method of intramammary administration, aureomycin was always demonstrable in both the blood and urine one hour postadministration. In all cases there was less than 1 microgram of the drug per ml. of urine or blood serum.

Results from the intravenous administration are presented in the last part of table 1 and the average of seven cases free from mastitis are presented graphically in figure 1. While there are individual variations, on an average, the highest value for the blood is found in the sample taken one hour after administration, with a gradual decline for subsequent samples until a zero value is reached at 24 hours. In the same figure, it will be observed that the level in the milk is low in the first-hour sample, but at two hours is essentially that of the blood. From this point on, the milk and blood levels are the same until the 24-hour samples, when no aureomycin is demonstrable in either milk or blood.

Levels in the urine vary greatly between cows, being markedly affected by the degree of diuresis. In general, the values are high for the first eight hours, reaching the maxi-

mum of 15.4 micrograms per ml. in the eight-hour sample. From that point, there is a precipitous drop to an average of 4.1 micrograms per ml. at 12 hours and to zero values at 48 hours, except for one case.

One animal (no. 854) with an active case of mastitis during the experiment had a level in the milk that was outside the range of those free from mastitis. Initial blood value was the

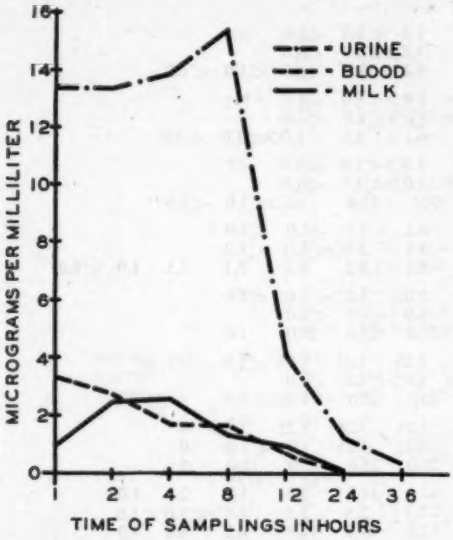

Fig. 1. Showing the average micrograms of aureomycin per ml. of milk, blood serum, and urine for seven cows at varying intervals following intravenous administration of the drug.

second highest in this group, dropping below the mean at two hours. Initial value of the milk, 4.9 micrograms per ml., was several times that of the normal cow. The two and four-hour milk samples rose to a higher level than the initial blood value.

In addition to assay for aureomycin in the milk, blood and urine, observations were made upon the irritating effect of the drug when introduced into the mammary gland and on the systemic effects of the intravenous administration. When introduced into the mammary gland, there were very slight irritating effects of both the ointment and aqueous forms, as evidenced by a slight increase in pH and chloride values. Complete recovery was noted in two or three milkings following the administration. The minor irritating effects noted in this report will bear further investigation.

When administered intravenously, aureomycin was found to be irritating to the tissue and to produce diuresis of varying degrees. Accidental deposit of minute amounts at the site of venipuncture gave rise to substantial irritation of tissue surrounding the puncture. Total urine output was determined only in one cow for 12 hours following intravenous administration. This animal (no. 854) voided 39 liters of urine in 12 hours. Extensive salivation was also noted with yellowish coloration of the saliva which lasted for approximately three hours postadministration.

Discussion of Results

Because of the great variations in the assay values of milk, the number of experiments is too few to warrant conclusion on the precise quantitative relationship between the amount of aureomycin administered intramammarily and that found in the milk. There are, however, certain trends that seem unmistakable. Part of the great variation in the milk following infusion into mammary glands can be explained by a dilution from the new milk being secreted and which varied from cow to cow. Difference in udder size is another factor that can account for some variation. Differences in the completeness of letdown of milk affected the level in the first-drawn milk where the aureomycin, particularly in mastitis and when administered in ointment, was more concentrated in the lower part of the mammary gland.

One of the most striking differences was that observed between the parenteral and ointment administration in the time when the udder became free of the drug. With one exception, the milk had but a trace of the antibiotic in the 24-hour milking after administration of the parenteral form, while in most cases when administered in the ointment form up to 6.2 micrograms per ml. milk were noted in the 72-hour sample. The one exception when the parenteral aureomycin was administered was when 1,000 mg. were infused, in which case a trace was detectable in the 60-hour milk.

Relatively slow elimination from the ointment form as contrasted with the parenteral form is believed to be due to trapping of the ointment in sinuses in the lower part of the gland. This is supported by the observation that red-stained ointment could be detected in the milk ten days postadministration.

While intravenously administered aureomycin reached the same concentration in the milk as was found in the blood, approximately two hours were required for equilibrium to become established.

It is of interest to note that never could more than 1 microgram per ml. be detected in the blood or urine following intramammary administration of either the ointment or parenteral forms and regardless of the quantity infused. This fact suggests that the mammary parenchyma is not readily permeable and also that intramammary administration is preferable.

Rapid drop in aureomycin level in the blood following intravenous administration causes speculation as to the place of its storage immediately following injections. That there must be such storage is evidenced by the high antibiotic values in the urine for the first 12 hours postadministration and the relatively slow drop in the blood. The yellow coloration of saliva shortly after administration suggests ready permeability of the salivary glands and possibly similar permeability of other tissues, from which it is gradually released into the blood. Large amounts of aureomycin in the urine for 12 hours postadministration suggests its suitability for use by this route in urinary infection.

Summary

1. Intramammary administration of aureomycin in the ointment preparation resulted in a greater interval between administration and complete elimination than intramammary administration of the parenteral form.

2. Intramammary administration of the agent in the ointment preparation or in the parenteral form resulted in various quantities being eliminated from different glands.

3. Intravenous administration of parenteral aureomycin resulted in a definite pattern of concentration and elimination in the milk, blood, and urine; the greater concentration and elimination taking place in the urine with the milk concentration equaling or being greater than that of the blood.

4. Various degrees of diuresis were exhibited when the parenteral form was administered intravenously.

5. Intramammary administration exhibited only slight irritation to the mammary parenchyma on initial administration.

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Vaccination Against Pneumoencephalitis

(*Continued from page 366*)

every three minutes. This allows 1⅓ minutes to administer the vaccine and 1⅔ minutes to add the vaccine to the nebulizer and change chick boxes for each group.

The cost of the pump is approximately $40.; the nebulizer about $3.; and the hood should not be over $5. If one is the least bit handy with tools, it can be constructed at little cost.

Summary

Experiments are related in which chicks were atomized or nebulized with the B_1 virus, as a vaccination procedure for the prevention of Newcastle disease, before they were removed from the incubators in which they were hatched. Under the conditions of these experiments none of the combinations tried can be considered to be satisfactory.

A method of nebulization of day-old chicks in the chick box in which they were placed when removed from the hatchers has been developed, however, in which the experiments described appear to be quite successful. This method involves the administration of the vaccine while the chick box is covered by a cellophane hood. Forced air for the nebulizer was obtained by the use of an electric paint-spray pump which gives a force of approximately four pounds of pressure per square inch. By this method a group of 100 day-old chicks could be satisfactorily vaccinated with the B_1 virus every three minutes.

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Accidental Warfarin Poisoning Of Young Pigs: A Hematological Report

OLIVER F. REIHART, D.V.M., and HELEN WYANDT REIHART, S.B., M.S., Omaha, Nebraska

ON May 29, 1951, one of the writers (O. F. R.) was called in consultation by a local veterinarian to examine a number of young pigs which apparently were bleeding to death.

Approximately 12 days earlier the pigs had been given access to creep feeders in which were placed rolled oats, supposedly reinforced at the feed mill with a new antibiotic supplement. On the morning of May 28, the boars, then approximately four weeks of age, were castrated by the veterinarian in attendance. In order to catch the boars easily for castration, all pigs were crowded into a small pen. After the operation, pigs were turned back to the sows. By afternoon of the same day, several of the castrated animals were dead, apparently of hemorrhage, and others continued to bleed from the operative wound. On the following morning, many gilts, as well as additional castrated boar pigs, were dead or dying.

Lesions demonstrated in the females indicated that bleeding had occurred into the tissue spaces, principally on the inner surface of the front legs, while hematoma in the males usually involved the inner surface of the hind leg and the groin. Whenever an animal was bumped by others in the pen, or bruise was caused by straddling the feeders or being trampled by the sow, large hemorrhagic areas and subcutaneous hematomata appeared. Bruises on the gilts appeared to be the result of straddling the feeders, while lesions in the boars apparently resulted from handling during castration. A few animals were bleeding from the nose and mouth, but none was passing blood by rectum. Hemorrhage and weakness were the only visible signs of illness.

Two live animals were sacrificed for laboratory study and hematological examination with results shown in the tabulation following.

Determination	Pig 1	Pig 2
Hemoglobin	2.6 gm.	2.7 gm.
Erythrocytes	1,750,000	1,840,000
Leukocytes	5,900	9,000
Platelets	168,000	250,000
Reticulocytes	22.5%	Not done
Differential		
Neutrophils, seg.	20%	2%
staff	29.5	7.5
young	4	4.5
myel.	0.5	3
Eosinophils	5	1
Lymphocytes	30.5	68
Monocytes	10.5	8
Plasma cells	0	0.5
Histiocytes	0	1.5
Blasts	0	4
Nucleated red cells (per 200 WBC)	177	72
Hematocrit	10.2%	Not done
Sedimentation rate (Westergren) 15 min.	< 1 mm.	Not done
60 min.	2 mm.	Not done
Coagulation time (Lee and White)	No clot within 6 hr. in either	
Prothrombin time	No detectable clot within 30 min. in either plasma	
Clotting time of recalcified plasma		8 min. (frail clot)
Icterus index	3	5
Van den Bergh		
Direct	Neg.	1.04 mg.
Indirect	0.2 mg.	0.8 mg.
Blood smear	Both showed extreme variation in size and shape of red cells, bizarre red cell forms, numerous polychromatophilic red cells and a few Howell-Jolly bodies.	

Aside from the severe anemia, the striking feature of the blood picture was the markedly prolonged coagulation and prothrombin times. These might have resulted from an absence or severe deficiency of any one of the various coagulation factors; namely, fibrinogen, thromboplastin, prothrombin or accelerator factors; or to the presence of some circulating anticoagulant such as heparin. To ascertain which factor was responsible, further tests were performed. The platelet counts were essentially within normal limits.

Tests for fibrinogen (qualitative) were strongly positive in each plasma, indicating that lack of fibrinogen was not responsible for the bleeding.

To distinguish between a circulating anticoagulant and a deficiency of plasma factors, the clotting time of recalcified plasma was

Fig. 1. Extent and severity of hemorrhages in the anteromedial aspect of the hind leg and extending into the inguinal space in a castrated pig.

determined, after diluting it with similarly prepared plasma from a normal pig, with the following results:

Recalcification Time					Sick Pig (2) 8 min.	Normal Pig 45 sec.
Dilution	4	(sick	pig)	to 1	(normal)	60 sec.
	1	"	"	" 1	"	45 sec.
	1	"	"	" 2	"	45 sec.
	1	"	"	" 4	"	45 sec.

The rapid clotting time with even one part of normal plasma to four parts of the affected pig plasma ruled out the presence of an appreciable amount of circulating anticoagulant and pointed to a deficiency of some plasma factor[1].

In an attempt to further clarify the problem, several drops of thromboplastin solution were added to the unclotted whole blood. A fragile clot formed in two hours instead of immediately as it should have done if the deficiency was that of thromboplastin[4].

Prothrombin time was repeated, diluting the plasma with prothrombin-free, normal pig plasma and with normal bovine plasma, freed of prothrombin by barium sulfate adsorption. No clot formed during the period of observation (30 minutes). (Prothrombin time of two normal pig plasmas, before adsorption, 13 seconds and 16 seconds; bovine plasma, 34 seconds.) If any plasma factor other than prothrombin had been deficient, the plasma should have clotted within the normal range for diluted plasma since that used for dilution contained all of the coagulation factors except prothrombin. (Bovine plasma is especially rich in factor V.)[3]

Since the other tests seemed definitely to rule out the presence of a circulating anticoagulant and the absence of fibrinogen, of thromboplastin or other coagulation factors and the platelet counts were within normal limits, the only conclusion that logically could be drawn from the hematological examination was that the deficiency was that of prothrombin. In view of the history, it would seem logical that some substance in the feed interfered with its synthesis. With the increasing use of warfarin for rodent extermination, it was suspected that the feed might accidentally have been contaminated with that or some similar dicumarol-like substance since the blood findings were in keeping with such a suspicion.

Investigation revealed that warfarin rat poison had been mixed by the feed dealer on the day that the farmer had obtained his feed. There are two possibilities whereby the warfarin might have been incorporated into the feeding mixture. It might have been added by mistake in place of the antibiotic supplement or, secondly, the feed for the farmer might have been mixed following use of the mixer for preparing rat poison. There is a possibility that enough warfarin might have been left in the mixer, if it was not thoroughly cleaned, to contaminate the feed mixture. This possibility was emphasized by the fact that in another part of the state a large number of pigs died with similar symptoms and definite information was available that the feed was mixed immediately following the use of the mixer for the preparation of warfarin rat poison in large quantity for a local rat extermination drive. The mixer was not cleaned following its use for mixing the rat poison.

In the case reported here, the farmer lost 56 pigs out of a total of 120 which had access to the feed. It is possible that had the true nature of the trouble been recognized immediately, more pigs might have been saved by the prompt administration of large doses of vitamin K.

Summary

1. Fifty-six of 120 pigs died from accidental warfarin poisoning through contamination of mill prepared feed.

2. Death occurred as the result of hemorrhages due to prothrombin deficiency.

Fig 2. Illustrating profuse hemorrhage into tissue spaces in the region of the humeral-radial articulation and in the axillary space, resulting from a bruise acquired during crowding or self-inflicted by straddling creep feeders.

3. The fatal cases occurred principally in those animals which either had been castrated or bruised by rough handling.

4. It was not possible to determine the dosage of warfarin which the animals received. However, some of the pigs had access to the contaminated feed daily for as much as 12 days.

5. Failure to clean a mixer following its use for warfarin may leave an amount of the substance in the mechanism sufficient to contaminate subsequently prepared feed mixture.

6. Laboratory data are presented to demonstrate the cause of the coagulation deficiency.

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Zoo Veterinarians Meet

Approximately 35 persons attended the seventh annual meeting of zoo veterinarians in Atlantic City on June 24, 1952. The members of this group meet each year during the national convention to present papers, case reports, and discuss various veterinary problems particular to zoo animals.

Among interesting reports presented this year was included that made by Dr. Lester Fisher who described the autopsy findings in the famous 21-year-old gorilla "Bushman" which died at the Lincoln Park Zoo in Chicago. He stated that a total of 10,000 histological sections were made from tissue obtained from this animal, which were studied by a number of specialists in various fields. A complete report is expected to be published.

Dr. David Coffin, Boston, Mass., reported on some of his work in Peru and in the jungles east of the Andes in South America which had to do with the psittacine birds in their natural habitat.

The secretary of this organization, Dr. Patricia O'Connor, Staten Island Zoo, Staten Island 10, N. Y., advises that those who wish to have their names placed on the mailing list to receive copies of zoo case reports may contact her directly.

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Infertility in Mares

(*Continued from page 363*)

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Value Of Blood Examinations In Diagnosis Of Canine And Feline Diseases

SEYMOUR D. NORD, D.V.M., New York, New York

THE purpose of this paper is to apply knowledge gained by blood examinations in small animal medicine to a better understanding of the pathology revealed and treatment indicated.

Blood examinations are of value in all cases in which the practitioner is unable to make a reasonably positive diagnosis and prognosis following a thorough physical examination. To properly interpret results of such examination, it is necessary to consider pertinent clinical findings.

For routine laboratory procedures, a 5 cc. sample of blood should be drawn and placed in a vial containing 10 mg. of potassium oxalate. The amount of oxalate always should be kept to the minimum needed because an excess will cause damage to cells.

Routine examination consists of total red and white cell counts, hemoglobin determination, and a differential leukocyte count. Various authors give different normal values for the dog, which is not surprising considering variation in breeds. The following values have been established at our laboratories for the dog.

Erythrocytes: 5.7-7.8 million per cu. mm.; average 6.4

Hemoglobin: 12-17 gm. per 100 cc.; average 14.5 gm.

Leukocytes: 8,500-14,000 per cu. mm.; average 11,600

Neutrophiles (including stabs): 58-79%; average 70-71%

Basophiles: 0-1%

Eosinophiles: 2-10%; average 4%

Stabs: 1 per 3-8 mature neutrophiles; average 1 per 4 or 5

Monocytes: 2-8%; average 5%

Lymphocytes: 13-28; average 20%

Blood Value for Cats

Kirk[1] gives the leukocyte count in cats as 8,000 to 15,000. Coffin[2] (quoting from Craig, Kolmer and Boerner) gives the range as 5,000 to 40,000, erythrocytes as 7 to 10 million, and hemoglobin as 8 to 13.8 gm. per 100 cc. The author has no opinion about the apparent discrepancy except that the upper limit of 15,000 is too low. The differential appears to follow that of the dog except the percentage of lymphocytes may be a little higher and the neutrophiles lower.

The erythrocytes and hemoglobin determinations are significant in determining hemoconcentration and anemia. The former results almost always from loss of fluids (dehydration) and is indicated by abnormal hemoglobin and erythrocyte values. Subnormal hemoglobin values are always found in generalized anemia. The total erythrocyte count is either low or normal.

Anemia

Iron Deficiency. Erythrocytes contain less than the normal amount of hemoglobin. This may be expressed best mathematically not as *color index,* but as mean corpuscular hemoglobin.

The formula is:

$$\frac{\text{hemoglobin (in grams per 1,000 cc.)}}{\text{erythrocytes (in millions)}}$$

Thus, if the erythrocyte count were 6,000,000 and the hemoglobin 12 gm. per 100 cc.

$$\frac{120}{6.0} = 20 = \text{mean corp. Hb.}$$

Coffin[2] gives 19.7 to 24.6 as normal.

Iron deficiency anemia results either from insufficient iron intake (due to poor diet or refusal of animal to eat while ill), failure to absorb iron from the intestines (due to enteritis), or loss of iron through loss of blood from the body (parasitism or hemorrhage).

Cells are generally smaller than normal and each cell contains less hemoglobin, thus the term microcytic hypochromic anemia. Large pale areas in the center of the cells are usually apparent.

Aplastic or Hypoplastic Anemia. There are fewer RBC and less hemoglobin than normal. Erythrocytes are normal in appearance. Cause is failure of the bone marrow to produce a sufficient number of red blood cells. This occurs when there is damage to the bone marrow resulting from diseases of the bone or when metabolism is deranged by infectious diseases, nephritis, hepatitis, or malignant neoplasm.

Hemolytic Anemia. Due to destruction of RBC observed in leptospirosis, piroplasmosis, hemolytic streptococcus and staphylococcus infections, leukemia, and certain poisons. Both count and hemoglobin values are lower than normal. When the body attempts to compensate by producing new erythrocytes faster than normal, immature forms are found in the blood. These are the normoblasts (nucleated cells) and the reticulocytes. The latter are larger than mature erythrocytes, but they may be demonstrated only by special technics. A few normoblasts are observed frequently in normal blood specimens.

Abnormal erythrocytes also may be found in this type of anemia. Abnormalities include polychromatophilia (variations in the staining of the cells), basophilic strippling (small basophilic granules throughout the cell), and Howell-Jolly bodies (one or two large basophilic granules in the cell). Abnormally shaped cells appear to be rare in dog anemia.

It should be kept in mind that all anemia will not fit entirely into one classification but may be combinations of two or more types. Administration of iron is indicated only in those patients in which an iron deficiency anemia is determined.

White Blood Cell Count

The leukocyte count is generally the most useful part of the examination when one is faced with some obscure internal ailment. Almost all serious internal ailments will affect the blood picture in one way or another.

Leukocytosis is an increase in the number of circulating leukocytes. Physiologically a transient leukocytosis occurs after meals, after exercise, and during pregnancy. Pathologically, leukocytosis is due to acute bacterial infections or certain neoplastic conditions. Leukopenia is a decrease in leukocytes. Pathologically, it may be due to virus diseases, but may also result from debilitation and possibly certain bacterial infections of the paratyphoid group. Leukocytosis almost always involves the neutrophiles only. In leukopenia all cells usually are affected.

In interpreting leukocyte count, the differential count is of prime importance. In many cases, the total white count is still within normal limits, but the differential count will show a definite change. A high percentage of stabs as compared to mature neutrophiles indicates that the count is going up; a low percentage, that the count is falling; and a normal percentage, that the count is remaining constant. The disappearance of eosinophiles is an indication of the severity of the disease. A high eosinophile count is most likely due to an allergy. In leukemia, the blood is invaded by lymphocytes which may make up to 97% of the total circulating leukocytes. (These lymphocytes are immature forms and are larger than normal. They cannot be differentiated from myeloblasts except by special methods.) In pseudoleukemia there is no invasion of the blood by lymphocytes.

Sometimes "toxic" leukocytes are observed. They may show vacuolation of the nucleus, basophilic granules in the cytoplasm, or basophilic cytoplasm. Their appearance in large numbers is an indication of the severity of the disease. In leukopenia, neutrophiles with seven, eight or nine lobes barely connected by thin strands, are common. These appear to be senile forms. Completely degenerated "basket cells" and cells with fragmented nuclei (as opposed to segmented) may also be seen.

As regards specific diseases, a pronounced leukocytosis occurs in leptospirosis, metritis, pyometra, hemolytic streptococci infections, abscesses, osteomyelitis, peritonitis, pleuritis, acute bacterial pneumonia, and some neoplasms, particularly malignant ones. The de-

(Continued on page 384)

Compenamine And Procaine Penicillin: Comparative Plasma Levels In Dogs

J. N. SPENCER,* Ph.D., Terre Haute, Indiana

COMPENAMINE, the *l*-ephenamine salt of penicillin G, is a highly potent and stable form of penicillin[1]. In animal studies, it has been found to produce much more prolonged therapeutic plasma levels than other available penicillin preparations when administered in aqueous suspension[2] and to be no more toxic or irritant than procaine penicillin G[3].

Similar results, and a relatively low incidence of allergic manifestations, have been reported in man. Kadison, *et al.*,[4] have demonstrated that in the treatment of a wide variety of routine clinical infections in man, compenamine is equal to other forms of penicillin in its clinical efficiency. Moreover, in a series of patients, all of whom were sensitive to procaine penicillin G, less than 20% showed allergic reactions following the administration of compenamine. Similar results have been reported by Longacre[5].

In view of its relative freedom from allergic reactions, and the prolonged duration of penicillin plasma levels following its administration, a study was undertaken to determine the comparative duration of penicillin plasma levels following the intramuscular administration of compenamine and procaine penicillin.

Methods and Materials

The penicillin preparations employed in this study were:

1. Compenamine formulated for administration in an aqueous medium. Crystalline *l*-ephenamine penicillin G so formulated that on dilution with water at the time of use a homogeneous suspension containing 300,000 units of penicillin per ml. was obtained.

2. Compenamine in oil. Crystalline *l*-ephenamine penicillin G, micropulverized and suspended in peanut oil to contain 300,000 units per ml.

3. Compenamine in oil with aluminum monostearate. A suspension of *l*-ephenamine penicillin G in peanut oil with 2% (w/v) of the dispersing agent aluminum monostearate added, containing 300,000 units of penicillin per ml.

4. Compenamine in permanent aqueous suspension. A permanent, homogenous suspension of crystalline *l*-ephenamine penicillin G in an aqueous medium containing 300,000 units of penicillin per ml.

5. Procaine penicillin for administration in an aqueous medium. Crystalline procaine penicillin G so formulated that when diluted with water at the time of use a suspension of 300,000 units of penicillin per ml. was obtained.

6. Procaine penicillin in oil. Micropulverized crystalline procaine penicillin G suspended in peanut oil and containing 300,000 units of penicillin per ml.

7. Procaine penicillin in oil with aluminum monostearate. A suspension of micropulverized procaine penicillin G in 2% aluminum monostearate (w/v) in peanut oil containing 300,000 units of penicillin per ml.

8. Procaine penicillin permanent aqueous suspension. A formulation of crystalline procaine penicillin G in an aqueous medium containing 300,000 units of penicillin per ml.

Fifteen mongrel dogs having a mean weight of 43 lb. (range 31 to 52 lb.) were used in this study. None of the dogs had received penicillin in any form for at least ten days prior to the study and during the course of the study at least seven days elapsed after negative penicillin plasma assays were obtained before another penicillin preparation was administered. The animals were maintained in open runs and received the standard laboratory ration of Purina kibbled meal and ground horse meat.

Penicillin preparations were administered intramuscularly, deep into the gluteal muscles. The permanent aqueous suspensions of compenamine and procaine penicillin were administered in a dose of 100,000 units (0.33 ml.) per dog. All other formulations, of both compenamine and procaine penicillin were administered in a dose of 60,000 units (0.2 ml.) per dog. Blood samples for penicillin assay were drawn from the jugular vein* immediately

*Pharmaceutical Research Division, Commercial Solvents Corporation, Terre Haute.

TABLE 1. Comparative Duration of Penicillin Plasma Levels in Dogs Following Intramuscular Compenamine and Procaine Penicillin

Penicillin preparation	No. of dogs	Mean wt. in lb.	Dose u/dog		Mean penicillin plasma levels* — hr. after administration												
					0	1	6	12	24	36	48	60	72	84	96	108	120
Compenamine aqueous	10	40.7	60,000	Mean u/ml of plasma	0	0.167	0.216	0.122	0.096	0.088	0.081	0.077	0.027	0.015	0	0	—
				Dogs with plasma levels/dogs treated	0/10	10/10	10/10	10/10	10/10	10/10	9/10	9/10	5/10	1/10	0/10	0/10	—
Procaine penicillin aqueous	10	40.7	60,000	Mean u/ml of plasma	0	0.809	0.653	0.087	0	0	—	—	—	—	—	—	—
				Dogs with plasma levels/dogs treated	0/10	10/10	10/10	6/10	0/10	0/10	—	—	—	—	—	—	—
Compenamine in oil	10	40.7	60,000	Mean u/ml of plasma	0	0.322	0.335	0.233	0.214	0.117	0.094	0.071	0.048	0.017	0	0	—
				Dogs with plasma levels/dogs treated	0/10	10/10	10/10	10/10	10/10	10/10	10/10	9/10	8/10	4/10	0/10	0/10	—
Procaine penicillin in oil	10	40.7	60,000	Mean u/ml of plasma	0	1.197	1.004	0.145	0.008	0	0	—	—	—	—	—	—
				Dogs with plasma levels/dogs treated	0/10	10/10	10/10	7/10	1/10	0/10	0/10	—	—	—	—	—	—
Compenamine in oil with aluminum monostearate	5	45.2	60,000	Mean u/ml of plasma	0	0.163	0.202	0.268	0.150	0.064	0.065	0.058	0.048	0.006	0.006	0	—
				Dogs with plasma levels/dogs treated	0/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	4/5	1/5	1/5	0/5	—
Procaine penicillin in oil with aluminum monostearate	5	36.4	60,000	Mean u/ml of plasma	0	0.670	0.770	0.367	0.229	0.037	0.022	0.006	0.006	0	0	—	—
				Dogs with plasma levels/dogs treated	0/5	5/5	5/5	5/5	5/5	4/5	3/5	1/5	1/5	0/5	0/5	—	—
Compenamine permanent aqueous	25	46	100,000	Mean u/ml of plasma	0	0.310	0.387	0.304	0.368	0.173	0.139	0.087	0.063	0.009	0.005	0.002	0
				Dogs with plasma levels/dogs treated	0/25	25/25	25/25	25/25	25/25	25/25	25/25	22/25	17/25	6/25	3/25	2/25	0/25
Procaine penicillin permanent aqueous	15	44	100,000	Mean u/ml of plasma	0	1.912	1.176	0.188	0.024	0.013	0	—	—	—	—	—	—
				Dogs with plasma levels/dogs treated	0/15	15/15	15/15	14/15	7/15	1/15	0/15	—	—	—	—	—	—

*Mean calculated on the basis of all dogs treated.

prior to the administration of the penicillin preparation under investigation and at one, six, and 12 hours, and every 12 hours thereafter until negative assays for penicillin were obtained. All assays were conducted by the cup-plate method on plasma using *Bacillus subtilis* as the test organism[7].

Results

The results obtained are summarized in table 1. It will be noted that the duration of the penicillin plasma levels following compenamine were considerably greater than those following procaine penicillin. It produced plasma levels lasting 36 to 60 hours in 100% of the animals. With procaine penicillin, in no instance were plasma levels obtained in 100% of the animals lasting more than 24 hours. Figure 1 shows a comparison of the

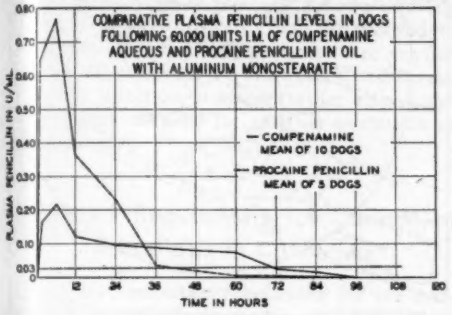
COMPARATIVE PLASMA PENICILLIN LEVELS IN DOGS
FOLLOWING 60,000 UNITS I.M. OF COMPENAMINE
AQUEOUS AND PROCAINE PENICILLIN IN OIL
WITH ALUMINUM MONOSTEARATE
— COMPENAMINE
MEAN OF 10 DOGS
— PROCAINE PENICILLIN
MEAN OF 5 DOGS
PLASMA PENICILLIN IN U/ML
TIME IN HOURS

Fig. 1

penicillin plasma levels obtained following the administration of compenamine aqueous with those obtained following procaine penicillin in oil, with 2% (w/v) aluminum monostearate added. This latter preparation produced the most prolonged plasma levels of the procaine penicillin formulations studied.

In contrast to the greater duration, the penicillin plasma levels obtained following compenamine were not of as great a magnitude as those obtained following procaine penicillin. The maximum levels obtained ranged from 0.22 to 0.38 units of penicillin per ml. With procaine penicillin on the other hand, in no instance was the maximum level less than 0.77 units per ml. and with a dose of 100,000 units of the permanent aqueous suspension, exceeded 1.9 units of penicillin per ml. of plasma (table 1).

Summary

Compenamine, *l*-ephenamine penicillin G, produced more prolonged plasma penicillin levels in the dog than procaine penicillin G in a comparable dose and formulation.

One may anticipate more prolonged penicillin plasma levels following the administration of compenamine in an aqueous medium than are obtained following the administration of a comparable dose of procaine penicillin G in oil with aluminum monostearate added.

The author wishes to express his appreciation to Mr. George Craig for conducting the penicillin assays and to Messrs. D. F. Aldrich, H. V. Rogers, William Lowdermilk and F. T. Clark for technical assistance.

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State livestock sanitary officials have been advised by letter from the chief, Bureau of Animal Industry, that new federal regulations are contemplated which would require restriction on the importation of raw bonemeal, green bonemeal, and bones only, by approved establishments for further processing before release to mills and manufacturers of proprietary feed preparations.

The Bureau has recommended for feed supplements only those bonemeal products subjected to such temperatures that they may be considered sterile. The American Meat Institute and the Association of American Feed Control officials define two general types of processed bone for use as animal feed supplement. Steamed bonemeal is the dried, ground product obtained by cooking bones with steam under pressure. Bones are subjected to 20 to 60 lb. steam pressure (259 F. to 307 F.) for two to ten hours. Special steamed bonemeal is obtained by cooking dried bones, after the removal of fats and fibre, with steam under pressure in the process of obtaining gelatin and glue. Temperatures are in the same range as that outlined for steamed bonemeal, and resulting products are considered safe.

Plum Island, N. Y., Selected Site For Foot-and-Mouth Disease Research Institute

ON June 30, 1952, Public Law 431 of the 82nd Congress made available to the Bureau of Animal Industry, U. S. Department of Agriculture, $10,000,000. for the establishment of a laboratory and related facilities for the study of foot-and-mouth and other animal diseases. The law requires that the Secretary of Agriculture select a site for the laboratory, in accordance with the Act of April 24, 1948 (Public Law 496), after full hearings of which reasonable public notice has been given to those who reside within 25 miles from the island selected.

The previous legislation cited of the 80th Congress, approved on April 24, 1948, authorized the Secretary to conduct research on foot-and-mouth disease on a coastal island separated from the mainland by deep, navigable waters, and which is not connected to the mainland by a tunnel.

Public Law 119 of the 81st Congress, approved on June 23, 1949, provided $500,000. for the preparation of plans and specifications of laboratory buildings and related facilities, not to exceed $25,000,000. in total cost. The latter sum, however, was not appropriated. The Act specified that part of the $500,000. could be used for the purchase of an option on suitable land. Options were taken on a site on Prudence Island in the Narragansett Bay. Preliminary plans were submitted to the Appropriations Committees of the House and Senate as requested in the Act, but the Congress did not take further action until the passage of Public Law 431.

In the course of legislative action that led to the eventual passage of Public Law 431, both the House and Senate noted "legislative intent" that the laboratory be constructed on an island entirely under the control of the federal government, in addition to the previous restrictions that the island be surrounded by deep, navigable waters and not connected to the mainland by a tunnel. This eliminated Prudence Island from further consideration as it is not completely under the control of the federal government. Plum Island was mentioned on the Senate floor during discussion of the legislation.

Secretary of Agriculture, Charles F. Brannan, has now announced that Plum Island, in Long Island Sound, N. Y., has been selected as the site for this laboratory. Secretary Brannan reached a decision on the location after reviewing a report of four public hearings held in Connecticut and on Long Island, within a 25-mile radius of Plum Island as required by Public Law 431.

"Views expressed by those attending the hearing were divided concerning the actual location of a laboratory, but even those who opposed the Plum Island site recognized the need for the research," Secretary Brannan said. "On the basis of the facts presented before the hearing panel, it is evident that the many advantages of having the laboratory on Plum Island outweigh any possible disadvantages expressed by those opposing it. Only one-fourth of those attending the hearings protested the site, and only 1% of the total population residing within the 25-mile radius of this island objected to the location, either orally or in written statements."

Plum Island contains about 800 acres. It

lies about 1½ miles from the northern tip of Long Island and about 10 miles from the Connecticut mainland. It is about three miles long and about one mile wide at its widest point.

The island meets the requirements set forth by Congress in Public Law 496. The Department of Defense has agreed to make space available on the Island to the USDA for the construction of the $10,000,000. laboratory. The Defense Department also will provide for joint use of such facilities as docks, water, and other utilities, thus materially reducing the cost of constructing the laboratory. It will share facilities for water transportation.

No accurate information is available as to when facilities can be made available for beginning research work, but it is anticipated that there will be no delay. The need is pressing. Livestock interests will be awaiting progress reports anxiously and be relieved to learn that facilities and personnel are readied in case of emergency. The recent widespread vesicular infection in swine further emphasizes the urgency of need for such an institution as this promises.

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Proposed Regulations for Control of Brucellosis in California

Proposed intrastate regulations for the control of brucellosis in cattle, if passed, will prohibit movement of dairy cows between counties unless such animals are negative to the blood agglutination test or have been vaccinated during calfhood. This proposal would not affect animals for immediate slaughter which may be shipped under permit of the State Department of Agriculture.

Interstate regulations will require evidence of official vaccination to accompany animals shipped into the state or certificate of negative blood test by an approved laboratory, performed within 30 days prior to entry.

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Equine Encephalomyelitis

Infectious equine encephalomyelitis was reported from 28 states during the calendar year 1951. The lowest number of cases (762) was reported than for any year since the BAI began making an annual survey of the disease.

Estimates, by the Division of Virus-Serum Control, indicate that approximately 46,000 horses and mules were vaccinated in 1951. None of those vaccinated contracted the disease.

Entrance Rank of Veterinarians in the Army Veterinary Corps

When the Officers Personnel Act of 1947 established service credits for professional men commissioned in the armed services, veterinarians were required to enter as second lieutenants on the basis of the fact that schools of veterinary medicine were requiring only one year of preprofessional college training. At the present time, practically all institutions require two years of preveterinary college training; therefore, the reasons for the present entrance rank of Veterinary Corps officers is now unwarranted. The size of the Corps has nothing to do with the entrance rank of professional men and the Association has taken a firm stand to support bills in both the Senate and House of Representatives which amend this act so that veterinarians may be commissioned as first lieutenants immediately following their graduation.

Similarly unfounded are the reasons why the chief of the Veterinary Corps has been limited to the rank of Brigadier General, while chiefs of other medical services rank to Major General. These irregularities, together with the failure to include veterinarians in the bonus provisions given medical and dental officers who have volunteered for services, will, it is anticipated, be corrected. Certainly the veterinary profession cannot be penalized because of its cooperative effort with the armed services in providing personnel by the voluntary system to adequately man the Corps.

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Anthrax

Though it has been determined that imported bonemeal added to hog feed has been the source of infection in some midwestern swine droves, restrictions on imports of bone will not remove all danger of anthrax to susceptible animals.

Bureau of Animal Industry veterinarians have emphasized, and rightly so, that many infected areas exist; some not free of the disease for years. Movement of contaminated feed and bedding from these disease belts to noninfected premises is a possible source of infection. Steps taken by regulatory officials concerning imported bonemeal cannot be effective in preventing anthrax from all other sources of infection.

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European veterinarians have suggested the possibility that dogs might spread brucellosis.

Sixty Years of Veterinary Service

For the past 60 years, Dr. Stanley Smith, Columbia, Mo., has devoted himself to veterinary medicine.

When he graduated from the New York College of Veterinary Medicine in 1892, he returned to his home state and began the exceptional career of service in Columbia that to this day, and daily, is an influence on others.

Dr. Stanley Smith

Doctor Smith was raised on a cattle farm near Columbia, Mo., established by his father who brought the first purebred Herefords to Missouri, or indeed west of the Mississippi River. From an early age, he assisted in the care of these fine animals.

As recounted in many interesting careers, contact with a veterinarian was influential in his selecting the profession for a life's work. As a young man, Doctor Smith was employed by Dr. Paul Paquin, one of the first veterinarians in Missouri, when Dr. Charles B. Michener, then in federal employ, came to Missouri on foot-and-mouth disease control. Doctor Michener stayed at the Smiths' home and while there influenced this young man to seek a veterinary education.

Doctor Smith's first office was located in a livery stable, now the site of the city's post office. He became interested in trotting horses and imported and raised them for show and racing, in addition to conducting his private practice.

Since establishing himself, the doctor has kept alert always to change and developments within the profession. In 1923, he took graduate work at the Indiana Veterinary College and as recently as 1935 built a hospital and office to improve service to clients and animal owners. Nor were his civic responsibilities neglected. He served two terms as city councilman and two terms as mayor for Columbia. It was during his term as mayor (1905-07) that Columbia boasted the first paved streets and other marks of modern progress.

Doctor Smith is active in his present association on the clinical staff of the School of Veterinary Medicine, University of Missouri. He continues to make regular calls; senior students assigned accompany him. Such assignment is appreciated because of the opportunity of association with this kindly man of wisdom and experience. Not alone his past life and achievements, but his professional attitude and relations with clients are an inspiration to students and faculty members alike.

Doctor Smith has served as secretary and president of the Missouri Veterinary Medical Association and has been active in A.V.M.A. affairs. He has attended most national organization meetings since he began practice, including the recent Atlantic City meeting. His age is 80 years.

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Prolonged Survival Time of Frozen Semen

Significant implications may be drawn from the preliminary report of British investigators (*Nature*, 169:626, 1952) who have demonstrated vital sperm in semen after storage in a frozen state.

Limited trials are reported. Of 38 cows inseminated with diluted semen, frozen to —79 C., stored from two hours to eight days, and thawed immediately prior to injection, there was a conception rate of 79%.

It is suggested that this procedure offers possibilities for prolonging survival of spermatozoa, making unnecessary the loss of any quantity of semen produced by desirable sires.

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Relief of Dystocia in Underdeveloped Heifers

Dr. E. L. Eden, Jr., Pueblo, Colo., suggests division of the symphysis of the pubis for the relief of dystocia in undersized heifers. He claims that this simple operation performed under epidural anesthesia increases the diameter of the birth canal two to three inches and sufficient for delivery in most instances.

In a brief discussion (*Allied Vet.*, July-Aug. 1952), Doctor Eden states that with the exercise of care, complications are avoided.

Doctor Stone to Deanship at Washington

Dr. Ernest C. Stone, now chairman of the Department of Veterinary Physiology and Pharmacology, has been appointed dean of the College of Veterinary Medicine, The State

Dr. Ernest C. Stone

College of Washington, Pullman. Appointment will be effective September 1, 1952, when Dean John E. McCoy will advance to emeritus status after more than 30 years of service on the college staff.

Doctor Stone holds one degree (B.S. in chemistry, 1936) from Utah State College, and two from Washington State College (M.S. in chemistry, 1938; D.V.M., 1942). He has been associated with the staff at Washington in several capacities. He joined the veterinary staff in September 1946, moving from private practice at Kalispell, Mont.

Doctor Stone served as a line officer on a destroyer during World War II. He is the holder of two Bronze Stars for action in the European theater. Later, while in uniform, he did medical research work with the special projects division, stationed at Frederick, Md. At present, he is a lieutenant commander of Naval Reserves.

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Radioactive carbon used in the preparation of DDT is assisting in studies of resistance and killing powers of this insecticide. Entomologists can now register the amount of DDT absorbed by various stages of the metamorphosis of insects. This is expected to furnish important clues to more effective methods of control of these pests.

XVth International Veterinary Congress, Stockholm, Sweden

The Organizing Committee of the XVth International Veterinary Congress has issued official information concerning the coming session. Place of meeting will be Stockholm, Sweden, as decided at the London Congress in 1949. Dates selected are August 9-15, inc., 1953.

According to the preliminary program, the scientific portion of the Congress will comprise:

1. *Plenary Meetings.* These will deal with subjects within the following branches of veterinary science:

Infectious disease
Mastitis in cattle
Metabolic disturbances
Food hygiene
Comparative pathology

2. *Sectional Meetings.* These will be divided as follows:

I Infectious disease
II Diseases caused by animal parasites
III Poisonings
IV Metabolic disturbances, deficiency diseases and allergies
V Physiology and pathology of reproduction and of lactation
VI Animal husbandry
VII Diagnosis, therapy, and surgery
VIII Food hygiene
IX International veterinary coordination problems

Committees in participating countries have been appointed and invited to prepare proposed lists of speakers from their country. Dean W. A. Hagan is chairman of the United States Committee. Proposals have been made by the United States Committee after meetings in Chicago, Washington and Atlantic City. The finally approved list of speakers will be published by the Permanent Commission for International Veterinary Congresses and the Organizing Committee.

Preliminary plans also have been made in reference to tour details which will be announced soon. These will be arranged to afford delegates and visitors opportunity to attend the 1953 A.V.M.A. meeting scheduled for Toronto, Ontario, Canada, prior to sailing for Europe.

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What industrious Americans need most is a good parasiticide.

Use Spray Materials Cautiously

Severe losses resulting from improper use of insecticides, though isolated, are reported. Failure to prepare the proper dilution of benzene hexachloride for cattle spray has resulted in death of adult cattle and calves.

Dr. J. E. Stuart, chief, Bureau of Agriculture, California Department of Agriculture, advises of death losses in cattle and horses as a result of spraying animals with tetraethyl pyrophosphate (TEPP), an extremely poisonous insecticide designed as a plant spray. TEPP should never be used on livestock in any concentration nor in dairy barns or other buildings used to house animals.

New insecticides are powerful killers, and though safety margins are relatively narrow, they are adequate if precautions are taken and mixtures prepared as recommended by the manufacturers. Serious injuries and damage may result from careless use.

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New York Metcalf-Hatch Law

New York state legislation referred to as the Metcalf-Hatch Law became effective on July 1, 1952. This law permits requisitioning, in lieu of destruction, of unlicensed, unwanted, and unclaimed animals by either the New York State or City Commissioner of Health for experimental purposes in approved medical institutions.

In spite of vigorous opposition, the legislation was passed, giving evidence that advantages pointed out by proponents of the bill were convincing and acceptable. Reports of methods used and benefits derived have influenced the public as well as legislators. This fact, with improvements in facilities for handling animals used for experimentation, tends to refute arguments of those who have assumed the position that animal experimentation was simply cruelty and that nothing was to be gained from scientific research making use of various animals.

The new law is expected to eliminate undesirable activities that have concerned strays confined in municipal shelters. It will also permit public inspection of laboratories. Misdemeanor provisions assure kindly and humane treatment, proper housing, feeding and management.

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Dinter in Norway suggests transmission of swine erysipelas by stable flies, *Stomoxys calcitrans.*

Incidence of Filariasis in Dogs in Central Indiana

During a period from January 1, 1952 to May 1, 1952, 220 dogs used for research purposes at Pitman-Moore Research Farm have been routinely examined for heartworms by the filtest method to obtain information concerning the incidence of microfilaria. Of these 220 dogs, 28 (12.73%) were found to be harboring the parasite. This is the highest percentage thus far observed in routine screening procedures. Previously an incidence of between 7 and 9% was noted rather consistently on small numbers of dogs.—*George R. Burch, D.V.M.*

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Value of Blood Examinations

(*Continued from page 376*)

gree of leukocytosis generally parallels the severity of the disease. Secondary invaders in distemper produce leukocytosis.

Feline infectious enteritis produces a pronounced leukopenia. Infectious hepatitis also produces leukopenia in the early stages. Mild leukopenia is seen often in nephritis. This is probably due mostly to the effect of impaired kidney function.

For practical purposes, the leukocyte count will be of particular help in differentiating distemper, leptospirosis, and infectious hepatitis, and in diagnosing true leukemia, deep abscess, metritis, pyometra, osteomyelitis, and internal neoplasms.

Intelligent use of blood counts is of valuable service for those who desire evidence of the processes of diseases in patients referred for treatment. Continuous study will assist in evaluating results of theraupeutic methods selected.

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PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.
Manhattan, Kansas

The veterinary clinician is frequently called upon to make a diagnosis in cattle of a condition in which the most marked symptom is bloody urine. With increasing frequency, a laboratory diagnosis demonstrates that the disease under investigation is bovine leptospirosis, which is ascribed to infection with the *Leptospira bovis*, an organism closely related to the *Leptospira canicola* of dogs. This organism (*L. bovis*) is found abundantly in the urine of infected animals. Though the exact mode of contracting the infection has not been demonstrated, there is good reason to believe that the urine of an active case, and of an outwardly recovered case, is the transmitting agency by its contamination of food supplies, and that infection may occur through inhalation of spattered urine. In recovered animals, the urine continues to harbor the Leptospira for at least three months following apparent recovery. Some affected animals die because of this infection; those that recover are said to be immune.

To summarize, bloody urine is observed in at least 50% of cases as a clinical symptom—frequently it is the first noticeable symptom—of infection with *L. bovis*; premature births are observed in about 25% of the cases. On autopsy, white spots on the kidneys are highly suggestive of this infection; sanitation, with removal of disease-free animals to high ground, is essential. In very valuable breeding cattle, terramycin and even penicillin have been recommended, though in man the latter did not destroy the organisms in the kidneys.

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Teat Anesthesia

Johnston, in the *Veterinary Record* for March 8, 1952, describes a method of anesthetizing the bovine teat so that surgery may be done on it with no resentment on the part of the animal. As we interpret his method, it consists in removing all milk from the quarter by means of a teat tube. Then an adrenalin-free, local anesthetic is deposited in the teat canal. After an elapsed period of five minutes, suturing of a wound may be effected with no resentment on the animal's part. Of course, all the usual steps of aseptic surgery are also followed. (*Vet. Med.*, 47:112 [Mar.], 1952).

The *South African Onderstepoort Journal of Veterinary Research* (vol. 25, no. 2, July 1951) has a very informative article about Demyelinating Diseases of Sheep Associated with Copper Deficiency. The disease is known locally as lamkruis. It is an ataxia of lambs associated with a copper deficiency, though it appears that this is not the primary cause, and therefore, the belief is expressed that other factors may be present that interfere with copper utilization. There is stumbling first, then inability to rise, and finally death. On autopsy, the control nervous system is involved to the extent that the myelin is partly destroyed. Cavity formation may involve the cerebral hemispheres.

In the coastal areas of South Africa, the disease is apparently prevented by administering or giving access to copper sulfate to pregnant ewes. One ounce of copper sulfate in a gallon of water, given at the rate of 1 oz. each week from the beginning of conception, is effective in reducing losses. Providing pregnant ewes an opportunity to lick a salt block, in which are incorporated 8 oz. of copper sulfate in 100 lb. of lick, is beneficial. It is more difficult to evaluate the copper treatment of affected lambs; some recover without treatment, and in others, the demyelination is so extensive that recovery is not possible.

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In regard to the time of vaccinating pullets for Newcastle disease, it is reported in the 1951 Report of the chief of the U. S. Bureau of Animal Industry that an attack of this disease damages egg quality permanently; also that White Leghorn pullets, vaccinated with live Newcastle virus three months after they had begun to lay, stopped laying temporarily." When laying was resumed, the eggs were of small size, "and rapid disappearance of thick white." Then another group of White Leghorn pullets were vaccinated at three months of age, which is a good deal ahead of the normal egg production period. Pullets so vaccinated showed "no difference in quality . . . between their eggs and those of unvaccinated pullets that did not have the disease." These facts are presented as an argument for the vaccination for Newcastle disease before the beginning of egg production in those regions where this disease is prevalent.

PUBLIC HEALTH

JAMES H. STEELE, D.V.M., M.P.H.
Atlanta, Georgia

A report from Norway (C. W. D. Levy, Diphtheria Epidemic, *Nordick Hygiensk Tidskrift*, 1950, p. 268) describes an epidemic of diphtheria among the personnel of a Norwegian municipal hospital. The epidemic is ascribed to raw milk from the hospital farm, where the dairyman and his wife were found to be carriers. Patients and users who used pasteurized milk were not infected. Altogether there were 50 persons with clinical symptoms and 24 carriers were found. Of these, 32 and 17, respectively, had previously been immunized. Immunized persons showed a milder course of disease.

The widespread acceptance of pasteurization of all milk products, including ice cream, cheese, and milk drinks, in the United States has prevented many milk-borne epidemics of human diseases which formerly were common. The production of clean wholesome milk from disease-free cows does not insure its freedom of pathogenic bacteria which may be introduced by man. As long as fluid milk must be handled by human hands and is exposed to the aerosols which are expelled from the mouth and nose of man, there is the possibility of contamination.

Over 80% of all fluid milk and other milk products consumed in the United States is pasteurized. Many states now have state laws which require pasteurization of all fluid milk and cream. The public health veterinarian has been a leader in obtaining the approval of milk pasteurization regulations and laws. The veterinariary practitioners have been strong supporters of such programs. The problem of getting the remaining 20% of raw milk products pasteurized is one that will require the support of all persons interested in public health. The place to start is your community. A regulation requiring the pasteurization of all milk products is public health protection.

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Results of a survey of food poisoning in Britain revealed that 91% of outbreaks were due to Salmonella infections, *Salmonella typhimurium* being responsible for 75%. Processed meat and duck eggs were the principal sources of infection.—*Pub. Hlth., London.*

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Brucellosis is most common in male adults and is the greatest occupational disease of farmers.

Salmonella Food Poisoning

Dr. R. H. Hutcheson, Tennessee commissioner of public health, has reported an outbreak of food infectioon which occurred in a small college (675 students) located in the eastern part of the state. A total of 193 young men and women were reported to have become ill ten to 36 hours after eating chicken. The majority became ill after a Sunday noon meal, but 30 additional cases followed the evening meal on the following day. Fried chicken was the article of food common to both meals. While no food was available for examination, the history pointed to fried chicken as the vehicle of infection. Seven food-handlers showed positive stool cultures for *Salmonella oranienburg* and all gave histories of illness following the eating of the meal on Sunday.

The chickens were obtained from a packing house and an attempt is being made to trace infection back to its original source. This is the first isolation of *S. oranienburg* in Tennessee.

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A recent article in the *Annals of Internal Medicine*, November 1951, by H. E. Hall, *et al.*, pointed out that the study of the effects of various antibiotics on 67 Puero Rican leptospirosis patients revealed that these agents had no apparent beneficial influence on the course of disease. They did not prevent fever nor jaundice, nor the degree of renal involvement. The authors believe it is doubtful whether any of the antibiotics can be used successfully in the treatment of human patients who have leptospirosis.

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Jungle yellow fever was reported in Central America in the early summer of 1951 in man and monkeys (152 cases and 40 deaths were recorded in Costa Rica). Field investigators have reported hundreds of monkeys dead in the jungle. Jungle yellow fever has an animal reservoir in monkeys and certain South American marsupials. It has been postulated by some investigators that large epizootics occur at periodic intervals and spill over into man in rural areas. It is transmitted to man by mosquitoes.

POULTRY PRACTICE PROBLEMS

W. R. HINSHAW, D.V.M., Ph.D.
Frederick, Maryland

Estrogens for Finishing Chickens and Turkeys

Diethylstilbestrol is the only commercial estrogenic compound which is permitted by the U. S. Food and Drug Administration to be sold interstate for use in improving the finish of chickens and turkeys. It is not permitted to be used in the feed, and must be injected under the skin on a part of the body that will not be used for human consumption. The maximum level allowed is 30 mg. per bird.

The accompanying figure illustrates one recommended method for injecting diethylstilbestrol pellets in turkeys. The same procedure can also be used for chickens. The automatic injector shown is one of the many designs sold by manufacturers of the pellets. Some operators prefer to inject the pellet from the reverse direction and state that there is then less possibility of its being left outside than when the injection is made in the reverse direction. It is important to inject the pellet subcutaneously and to insure that it has been deposited properly by palpation with the thumb and forefinger used for holding the fold of skin for injection. It is also essential that the drug be deposited far enough forward at the base of the skull to insure that any residue will not be in the neck portion sold for human consumption.

The greatest value of estrogen pellets comes from improved fat finish in young birds. Feed efficiency is not improved nor is weight gained faster by their use. Quality of meat in chicken fryers and broilers is improved and hormonized chickens usually bring a premium price. The cost for injection is approximately 1 cent per lb. and the increased cost to the consumer is as much as 5 cents per lb.

There is probably less advantage in using diethylstilbestrol for turkeys than for chickens. It is generally agreed that female turkeys do not improve as much by its use as do males. Two desirable results follow its use; (1) fewer pin feathers develop, and (2) more fat is deposited under the skin. The drug may be used to aid in earlier finishing of turkeys. At the Washington Agricultural Experiment Station, Stadelman (*Norbest News,* 16:1 [March], 1952) found that turkeys as young as 17 weeks of age could be finished by the aid of the drug. He found it required two 12 mg. pellets for males and one for females. He also found that the addition of 0.2% of thiouracil (the maximum allowable by the U. S. Food and Drug Administration) to the mash for a week before implanting the pellets helped to curtail the mating instinct especially in toms. It is necessary to keep the males separated from the females after treatment to prevent injuries to the females.

Courtesy Washington State Agricultural Extension Service

One method of implanting a diethylstilbestrol pellet with an automatic injector.

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It is possible according to Edgar, *et al.,* (*Poultry Sci.,* 30:911, 1951) to increase the resistance of chickens to coccidiosis by selection. They found that S. C. White Leghorn chickens selected through four generations developed an increasing resistance as evidenced by lowered mortality and morbidity rates.

VETERINARY PARASITOLOGY

A. O. FOSTER, B.A., M.A., Sc.D.
Beltsville, Maryland

Etiology and Treatment of Salmon Poisoning

A study of salmon poisoning in dogs by Cordy and Gorham[1] incriminates a Rickettsia (family Chlamydozoaceae) as the probable etiological agent. The disease occurs in northwestern United States, California to Washington, and southwestern Canada where dogs and foxes have access to raw salmon infected with metacercariae of the trematode, *Troglotrema salmincola*. The flukes, which mature in the intestine of the dog or related host, are vectors of the pathogen. In chemotherapeutic studies, the authors[2] confirmed the value of sulfonamides, using sulfamerazine and sulfamethazine instead of the previously recommended sulfanilamide, and demonstrated curative action with penicillin, aureomycin, and chloromycetin®.

The reports are an excellent review of the subject.

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A report[3] in Polish states that the larva of the pork tapeworm, *Cysticercus cellulosae*, is killed within six days by temperatures below —2 C., and within three days by proper treatment with brine. At 0 C. the parasite survived for 53 days, and in decaying meat for 26 days.

Although common in many countries, porcine cysticercosis is fortunately rare in the United States. Bovine cysts, *C. bovis*, are killed by a temperature of 56 C. (133 F.) and by prolonged exposure to freezing temperatures. Under meat inspection regulations, lightly infested carcasses and parts are considered safe if heated throughout to 140 F. (60 C.) or refrigerated for ten days (20 in the case of boned and boxed meats) at 15 F. (—9.5 C.). These regulations are probably adequate also for the destruction of cysts in measly pork, although the report cited makes no mention of this.

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Nasal Trichomonads in Swine

Reports from Iowa[7] and Michigan[8] disclosed a high incidence of trichomonad infection in the nasal passages of swine affected with atrophic rhinitis. Possibly the necrotic tissues merely afford a favorable medium for the propagation of the organisms, as suggested by Hegner and Alicata[9] in their description of trichomonad invasion of a facial lesion of a pig, but it may be significant that nothing has yet been learned about the cause of this disease despite its apparent recognition as a clinical entity for over a century.

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Giardia, Trichomonas, and Toxoplasma are injurious parasites of chinchillas, according to Dr. P. M. Newberne of the Auburn Polytechnic Institute[5]. Giardiasis is common and very serious, causing sudden deaths as well as chronic disease. It is an enteric flagellate infection for which atabrine, 29 mg. daily for four days, is recommended. Penicillin, up to 50,000 units daily, and sulfonamides are also advised to combat secondary invaders. For trichomoniasis, which is also serious at times, 1 to 2 gr. of sulfathalidine per day are advised. No treatment is of recognized value in toxoplasmosis.

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Studies on infectious enterohepatitis of turkeys at the University of Maryland[4] have emphasized that artificial infection induced by cultures of *Histomonas meleagridis* is not an entirely adequate substitute for natural infection in tests of drug action. Chlorohydroxyquinoline, at the level of 1% in all-mash feed, prevented the development of blackhead in turkeys that were inoculated with cultures of the organism but failed, in parallel trials, to protect against the development of naturally acquired infections.

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[5] *Auburn Vet.*, 7:59, 1951.

[4] DeVolt, H. M., *Poultry Sci.*, 29:924, 1950.

ABSTRACTS OF LITERATURE

Urine Changes in Canicola Infection of the Dog

Numerous urinalyses carried out at the Veterinary College of Munch[21] produced these interesting findings with respect to *Leptospira canicola* infection: Of dogs affected with leptospirosis, 70% showed albumin and 68% kidney epithelium in the urine; for dogs suffering from other diseases, the respective figures are much lower, 33% and 20%. In a clinically healthy dog, in which the urine pH value varied between 7 and 7.8, Leptospira were found for a period of eight months. However, severely ill dogs were always free of organisms when the pH value of the urine was between 5 and 6. *In vitro* experiments verified the finding that Leptospira are rapidly destroyed in acid urine (pH 5-6).—*R. S.*

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Aplastic Anemia of Cattle

Primary aplastic anemia, that resulting from defects of the bone marrow, is not common as a disease of cattle. Blood changes observed during studies of animals fed quantities of trichloroethylene-extracted soybean oil meal, were noted to be those associated with aplastic anemia[20].

The Minnesota workers report that the course of disease noted was either a rapidly progressive anemia with acute clinical manifestations and death or an insidious chronic form. Neither type was amenable to treatment. High temperatures characterized initial symptoms of the acute form. Anorexia, weakness, rapid respiration, decline in milk production, and the appearance of a nasal discharge, serous to bloody, were progressive. Bloody milk in lactating animals was noted, and in advanced cases, hemorrhage from the nostrils, mouth, and anus was described as profuse. Clots of black, tarry blood resembling rectal casts were passed. Hematuria was not observed. Symptoms and autopsy lesions were similar to those reported by Leasure and Twiehaus (*Vet. Med.*, 46:428 [Nov.], 1951).

In the majority of cases in 38 herds, a moderately high level of soybean meal was fed, extracted by the trichloroethylene process. This ranged from 1 to 3 lb. daily. Some calves died after having been fed the meal for as short a period as five weeks. The young animals appeared to be most susceptible.

Herd mortality depends largely on the amount of meal fed and the length of feeding period. Reduced leukocyte count was noted as early as two weeks after feeding meal containing an unidentified toxic fraction to young animals, and persisted for an extended period. Treatment failed to alter ultimate outcome of individual cases.

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Protein Requirements of Growing-Fattening Swine

Feeding trials at the Iowa station indicate a "protein-sparing" action of aureomycin added to corn-soybean oil meal ration, supplemented with vitamins and minerals[17]. Pigs receiving antibiotics in their ration gained an average of 0.12 lb. more per day and consumed 23 lb. less feed per 100 lb. of gain than those not receiving the antibiotic.

Protein levels of 16% from weaning to 75 lb.; 13% from 75 to 150 lb.; and 10% from 150 to 200 lb. supplied in these experiments met the requirements for adequate protein when self-fed.

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Experimental trials with a number of drugs indicate the direct action of enheptin-T on *Histomonas meleagridis*[18]. While vioform proved as active as enheptin-T *in vitro*, it was less active *in vivo*.

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The mercury column in fever thermometers is about one-tenth the breadth of a human hair.—*S. N. L.*

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Determination of Breeding Time in the Bitch from Vaginal Smears*

W. EDWARD NEWBERRY,† D.V.M., and
H. T. GIER, Ph.D.††

The approximate time of ovulation in the bitch and the proper time of breeding have been determined by microscopic examination of vaginal smears taken during estrum from 72 dogs.

Results of this work did not substantiate the general belief that all bitches are nine days coming into heat, nine days in heat, and nine days going out of heat; however, the average number of days in each phase of the cycle for the experimental females did not show a drastic variation from this generalization. It was found that the duration of proestrum ranged from four to 15 days. One individual accepted the male on the fourth day after the first signs of proestrum, while another would not engage in coitus until the 15th day. Occasionally a bitch would copulate only once, while others accepted the male repeatedly for a period considerably longer than nine days. Contrary to the general consensus, it was found that the second day after the first acceptance was not necessarily the time of ovulation in cases in which the female accepted the male longer than five days.

Some of the bitches showed a profuse bloody discharge throughout estrum, while others evidenced no hemorrhagic exudate during that time; therefore, the appearance of the exudate was not indicative of either a heat period or ovulation. The type of cells in the exudate served as a criterion for the progress of estrum, and from a study of these it was shown that the correct time to breed could be accurately determined. If vaginal smears were taken during estrum, the service of a valuable stud dog could be conserved and the problem of shipping a bitch to be bred, only to find she would no longer accept the male, could be eliminated.

*Contribution no. 125 (Department of Veterinary Medicine) and no. 245 (Department of Zoology). This work was done in conjunction with Kansas State College Experiment Station Project no. 321.

†Doctor Newberry, Troy, Mo., undertook this study and preparation of report while a senior student at the School of Veterinary Medicine, Kansas State College, Manhattan.

††Department of Zoology, Kansas State College, Manhattan.

Vaginal fluids were secured by inserting a pipette into the vagina and taking up a small portion. A drop of the resulting material was placed on a slide and a drop of toluidine blue added (a stock solution of 1% aqueous toluidine blue was diluted 1:10 for use). The

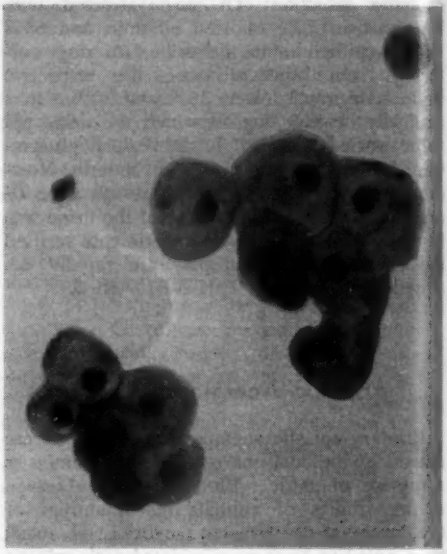

Fig. 1. Vaginal smear taken on fifth day of proestrum stained with haematoxylin. No leukocytes were present in the field photographed. X440.

mixture was allowed to stand for five minutes for the stain to react before a cover slip was put into place. Toluidine blue is a rapid but not a permanent stain. If a permanent slide is desired, Wright's or Giemsa's stains may be used. Slides were examined under the high power objective and cells within a field counted. For additional accuracy more than one field was examined.

A typical smear from a bitch coming into heat showed a various number of erythrocytes, non-cornified and cornified epithelial cells. On magnification of x430, non-cornified epithelial cells were characteristically large rounded cells with a light staining nucleus and nucleolus (fig. 1). Progressively, the following changes were noted: (1) As the cells became cornified in proestrum the corners became angular, the nucleolus disappeared, and nucleus became pycnotic and took a very dark stain (fig. 2). (2) The non-cornified epithelial cells de-

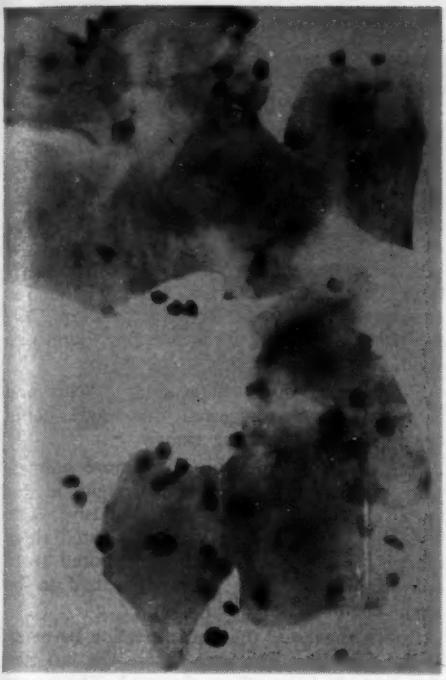

Fig. 2. Vaginal smear taken on third day of acceptance. Only cornified epithelial cells and red corpuscles were present. X440.

creased in number and the cornified epithelial cells increased (from late proestrum through the period of acceptance, all epithelial cells were cornified). (3) In the later part of the heat period, leukocytes reappeared (fig. 3) and later, non-cornified epithelial cells. When the leukocytes made their reappearance, the cornified epithelial cells began to disintegrate. In the event the female showed a bloody discharge at this time, the erythrocytes also became degenerate and imparted a chocolate color to the exudate. Table 1 is an example of a characteristic microscopic examination of vaginal smears from bitches during estrum.

Cornified epithelial cells completely disappeared from the vaginal discharge in three to five days after the last day of acceptance. For approximately one week thereafter, there were no cells of this type in either pregnant or non-pregnant bitches. For a period of six to ten days after estrum the vaginal fluid from non-pregnant females contained a few non-cornified epithelial cells, no cornified epithelial cells, and many leukocytes in gelatinous clumps. The smears from pregnant bitches showed white cells to be separate or in small clumps. The non-cornified epithelial cells were the most numerous, but after a period of ten to 12 days postestrum, there were, without exception, a few cornified epithelial cells present. The fluid became viscid and stringy in the non-pregnant female, while in the pregnant animal it remained thin and watery.

From other work (to be reported separately) the ovulation time was shown to be approximately 24 hours before the reappearance of the white blood cells in the vaginal smear. These data were in direct correlation with the ages of the embryos and a failure to recover ova surgically earlier. It was neces-

TABLE 1. Cell Count from a Bitch During Estrum

Days	Erythrocyte count	Leukocyte count	Non-cornified epithelial cell count	Cornified epithelial cell count	Remarks
1	100	0	10	5	Vulva swollen. Stood for male. Copulation not permitted.
2	100	0	0	10	
3	100	0	0	10	
4	100	0	0	15	
5	100	0	0	15	
6	100	1	0	15	Coitus
7	40	1	0	15	Coitus
8	20	1	1	10	Vaginal discharge dark in color. Repelled male.
9	10	5	2	10	Male not attracted by female.
10	5	8	12	1	3-8 cell embryos surgically recovered from left oviduct.
13	0	20	15	0	32 cell morula recovered surgically from right uterine horn.

*All cells from one representative field with a magnification of x430 were counted.

sary to use proper surgical technic and to control the excitement period during anesthesia. Rough manipulation or stimulation of the ovaries was found to cause premature ovulation.

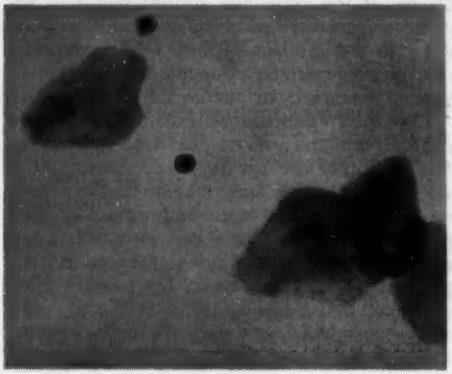

Fig. 3. Vaginal smear taken near end of period of acceptance. Cornified epithelial cells and a few white corpuscles only were present. X440.

The bitch regularly accepted the male 24 to 48 hours after the reappearance of the leukocytes in the vaginal fluid. After leukocytes were found in the vaginal smears, all bitches that were allowed to copulate conceived to the extent of one embryo for each ruptured follicle.

From this work, it was indicated that breeding a bitch in the 24-hour period following the appearance of white blood cells in the vaginal smear will insure pregnancy with one service.

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Castrating the Ridgling Hog

JOSEPH T. ALSTON; D.V.M., Tupelo, Mississippi

Confine patient in a V-shaped trough, if large, or on a canine table, if small. Be certain food has been withheld for 24 to 36 hours.

Make a three-to-four-inch incision through the abdominal wall an equal distance between the sheath and fold of the flank, and between the scrotum and anterior prepuce. If the incision is held open, one can usually see the undescended testicle so that it can be grasped with a forceps and removed. Local anesthesia is sufficient. Wound is closed with interrupted sutures of catgut or tape.

Advantage of the method is the provision for locating the testicle rather than the unsatisfactory procedure of inserting the hand into the cavity. The method cuts time; not over ten minutes is consumed for the entire operation.

Belladonna Poisoning in Swine

RUFUS A. MILLER, D.V.M., Lincoln, Illinois

On the evening of July 13, 1951, a pig approximately 12 weeks of age was presented at the hospital for postmortem examination.

History given was as follows: Eleven pigs had been purchased that morning and were delivered at 6 p. m. A fence had been erected during the day to separate these animals from others that were already in the pasture. Shortly after delivery, pigs were watered and fed garbage. At approximately 8:30 p. m., the new owner checked the swine and found one dead.

Postmortem disclosed a mild gastritis and enteritis. It was suggested that there could have been injury during transit.

The following morning, two more animals were dead and these were brought in for autopsy. Findings were not conclusive. The possibility of poisoning was considered since the pigs had been fed garbage secured from a local hospital. The garbage seemed to be fresh and of a fair quality.

It was suggested that an inspection be made at the premises. The area where the last two pigs had died was then observed. There was evidence of struggling and running movement. Inches away there were noted some partly chewed plants of deadly nightshade which had been chopped out of the new fence line. The last two pigs had been found six feet apart and approximately the same distance from the new fence. Evidently, they had preferred the chopped plant to that standing or the blue grass. The owner was advised to put the drove in the hog house and remove the poisonous plants from the pasture.

Six bushel basketfuls of belladonna were cut and removed. All spring and summer, four sows and 20 pigs had pastured there without ill effects.

Approximately 2 cc. of the fluid from the body cavities of one animal autopsied were injected intraperitoneally into a rabbit. Definite dilatation of pupils was observed. This confirmed the diagnosis.

The owner later reported that the remaining pigs were returned to the pasture and were making satisfactory gains.

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Concentration and anxiety spent on things past, and fearful contemplation of the future, is creating a country of wealthy widows.—*It's Said and Done.*

"VITALITY gives us that EXTRA we want in a dog food"

Champion Dabblu Dagmar shown completing her title with a three point show and Best Opposite Sex at Central Valley Kennel Club—with handler N. Finn. Owned by Dabblu Kennels.

Mrs. H. E. Dabb, Dabblu Kennels, 25810 Gading Road, Hayward, Calif., finished two champions in 1951. Her experience has proved how important the right food is for show dogs. She says, "We find feeding Vitality balanced diets keeps our dogs in top show condition, gorgeous coats, bright eyes and ideal Kerry Blue Terrier temperament. It's amazing what Vitality Breeders' Dog Food will do for a brood matron and her litter. At weaning time the matron has put on weight, coat in fine condition. Puppies strong, sturdy-boned, and no bowel troubles. We have tried other foods, but Vitality gives us that 'extra' we want in a dog food."

Find out for yourself, as Mrs. Dabb has, that Vitality's "plus nutrition" will give you the extras that build better show dogs.

Buy Vitality Specialized Diets at your feed, seed, food or pet supply dealer.

VITALITY BREEDERS' DOG FOOD. Has the extra nourishment it takes for breeding matrons, for pups in the critical stage of development, and for dogs in run-down condition. You won't find another dog food like it.

VITALITY BODY BUILDER. The complete diet for sound development and maintenance of bone, muscle, coat and temperament. Tops for day in—day out feeding.

VITALITY KIBBLED BISCUITS. Egg yolk and cheese whey added for "plus nutrition." Rich golden color shows the difference. Produces ideal stools. Excellent supplement for horse meat.

VITALITY MILLS, INC.

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Veterinarians Can Advertise

KENNETH B. HAAS, SR., Ed. D.,
and
KENNETH B. HAAS, JR., D.V.M.,
Chicago, Illinois

An excerpt from the forthcoming book, Business Practices in Veterinary Medicine

Dr. Kenneth B. Haas, Sr., is chairman, Department of Marketing, Loyola University, Chicago. He is also an author, lecturer and business consultant.

Dr. Kenneth B. Haas, Jr., is a graduate of Ohio State University, College of Veterinary Medicine, and former editor of *The Speculum*. He is now a practitioner in Illinois.

The codes of ethics of the various veterinary associations are rampant with "thou shalt nots" concerning advertising. Aside from a few cut-and-dried stringencies, they mention no "thou shalts" of veterinary advertising. Possibly it is assumed that any advertising that is not a "thou shalt not" is a "thou shalt." Such assumptions are not clearly intimated, however, and methods of acceptable advertising need to be clarified.

First, we must agree on the premise that veterinarians can advertise. They *can, do,* and *should.* Next, we must agree that certain advertising methods are acceptable, and some unacceptable. The acceptable methods soon narrow to three advertising plans, namely: by displaying proficiency, showmanship, and salesmanship.

Proficiency

Proficiency of the veterinarian and his employees causes favorable client awareness, and evokes public respect and attention in an ethical manner. It creates the most favorable and desirable form of advertising and publicity known as "word of mouth" or "reputation."

Showmanship

Showmanship of ethical proportions, with true intent, does much to reconcile profession and purse. Showmanship includes more than tricks and technics in the client's presence. It includes lofty motives of concern in the case, interest, compassion, the rendering of a service, as well as the neat physical appearance of the hospital and person. A well-equipped hospital and a low mortality rate are great prestige builders.

Salesmanship

By strictly ethical means, the veterinarian may advertise through demonstrating professional salesmanship. He should endeavor to sell or put-across to the laity, three things: himself, his organization, and his profession.

Selling Himself

The veterinarian must influence people to believe in his professional knowledge and ability. He must influence them so that they will follow his recommendations. The doctor must act in a positive manner—as if he knows. If he does not know, it is sometimes a mark of knowledge to admit that he does not. He should outline a comprehensive prognosis to include all possibilities, and then do his best to render a service.

The program of hygiene and sanitation as concerns animals will be followed much more carefully if the client has confidence in the veterinarian. In other words, he must possess that type of personality which will impress clients as to his honesty, sincerity, and good intentions.

The veterinarian, briefly, must make creative contact with the client, project his own pleasing personality in such a likable way that the client resistance is reduced, and the state of willingness and satisfaction is reached. A person who is not sure of his personal qualifications should become introspective about three things: his appearance, his speech, and his attitudes.

Appearance

The easiest of the personality traits to improve is appearance. Clients can be impressed through appearance—either good or bad. Clothing should be neat and appropriate. Teeth, hands and face should be clean. The body and hair should be well-groomed, posture good, health excellent.

Clothing proclaims the man, but fads or fastidious clothing should be avoided.

Language

Shakespeare, in King Lear, tells us "Mind your speech a little, lest it mar your fortunes." It is just as true today. The veterinarian should despise profanity, avoid slang and cliches; speak cautiously until he has a good notion of the climate of opinion, behavior pattern, the desires, the habits, and nature of the clients. A practitioner may be an expert therapist, but if he cannot use effective speech, he will handicap himself. A good veterinarian must substitute good speech habits for bad ones. He must learn to put snap into his voice so that it carries conviction.

The doctor must employ effective speech. He should enunciate and pronounce properly;

he will know when and when not to employ humor. His speech should be pleasing, correct and effective. Word slurring is a bad habit that can be corrected. Slurring will detract from the presentation, convey a bad impression, and create a lack of confidence.

An excellent method of determining voice deficiencies is the voice transcription method. Paying attention to speech and reading aloud are other methods. Deficiencies can then be corrected by picking a good voice to imitate, developing lung power through breathing exercises, consciously putting enthusiasm into words and tones, exercising the lips, tongue and jaws, having a physician examine the vocal apparatus. The pitch of the voice should be low rather than high. A lower voice is more pleasing, impressive, and authoritative to the client. If the problem is extreme, a speech instructor or speech school may be indicated. The American Speech and Hearing Association has offices in many of the larger cities for the purpose of assisting those who need such correction.

Attitudes and Habits

Clients are greatly impressed with attitudes. They are apt to be more cooperative when a happy attitude is assumed. Tact and patience are needed to satisfy clients, to win their liking, and to gain their respect. The veterinarian should adapt himself to their moods. Finally, he should respect his clients, remember their names, or at least address them by their names after being prompted by the secretary. Their judgment should be respected. Good attitudes mean: adaptation to people, introspection by the veterinarian-in-action, and satisfying client's needs.

Most practitioners need assistance in improving attitudes and habits. They should appraise themselves, and then have others appraise them. Certain qualities can then be developed, and others guarded against.

When poor habits are detected, they should be revamped. The great psychologist William James wrote, "Human beings are walking bundles of habits." Habit changing is not an overnight process, but persistence will accomplish the objectives sought.

The kind of advertising that has been suggested is ethical. It is also the most potent form of advertising known to psychologists. It has the virtue of costing nothing. And anyone can use it if he will try.

Some veterinarians do not agree with the philosophy of advertising. Indeed they shudder when the word is used in relation to their profession. However, a majority regard this negative attitude as sophomoric and refuse to immolate themselves on the altar of professional martyrdom. To remain in practice, the veterinarian simply *must* advertise—and he can maintain it on an ethical level and in line with the code.

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X-Ray Therapy

Dr. Myron A. Thom, Pasadena, Calif., is illustrated below making radiographic examination of the carpal region of a Thoroughbred. The tube-head of the *x*-ray unit employed by Doctor Thom for therapy in large animals may be observed in the lower foreground.

This machine is a 200,000 volt, G. E. unit, specially mounted for easy manipulation. Controls and tube stand are in a room adjacent to the treatment stall shown, which is lead-lined for safety.

Doctor Thom is an advocate of superficial and deep *x*-ray therapy in many anomalies of animals. The radiotherapist has the means at hand to provide almost immediate relief of pain and prompt reduction of swelling in ailments of the legs to which race horses are subject. Relief of symptoms associated with bowed tendons, calcium deposits, cancer, and excessive bone growth are regularly accomplished by *x*-ray therapy.

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TO BE SURE!

- POTENT
- UNIFORM
- PROVED RESULTS

★ Produced for the exclusive use of the Graduate Licensed Veterinarian

Grain Belt

ANTI-HOG CHOLERA **SERUM**

HOG CHOLERA **VIRUS**

ONE OF the most important responsibilities facing the veterinarian is the constant fight to keep hog cholera under control. Farmers depend on his professional skill and scientific knowledge to protect their investment from disease. For over 35 years the Serum and Virus method of immunization has served the swine producer with proven protection . . . life immunity and nearly 100% effectiveness. To help maintain this outstanding record, all the efforts of the Grain Belt Supply Company are directed toward supplying the veterinarian with dependable, quality products. You can use Grain Belt Serum and Virus with confidence.

Grain Belt Supply Company

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Member: Associated Serum Producers, Inc.

New Livestock Pest Control Film Released

Completion of a new 16 mm. color and sound motion picture entitled Livestock Pest Control has been prepared by the California Spray-Chemical Co., Richmond, Calif.

Local premiere showings of this new educational movie are now being scheduled throughout the country. Requests for showings will be filled in order of receipt and should be directed to the company's home office.

Such pests as screwworm, sheep ked, heel fly and cattle grub, which cause millions of dollars' loss to livestock men every year, are dramatically shown in extreme close-ups and in action. Practical scenes demonstrate the latest and most effective sanitation and control technics.

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Thoroughbred horses may be particularly sensitive to the influence of certain drugs. In fact, only 75% of the maximum dose of some is used. Particular care is exercised in the use of chloral hydrate intravenously for light chestnut horses of an excitable nature. During an experience of 28 years of surgery, covering a total of 2,000 horses anesthetized with chloral hydrate, three fatalities due to anesthesia have resulted, all in light chestnuts.—*J. Quinlan in Jour. South African Vet. Med. Assn., 23:21, 1952.*

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Cultures of *Streptococcus agalactiae*, collected from the udders of cows following penicillin therapy revealed no tendency to develop resistance to this antibiotic during the course of treatment.—*Charles M. Ford and Joe B. Wilson, Cornell Vet., 42:291 (July), 1952.*